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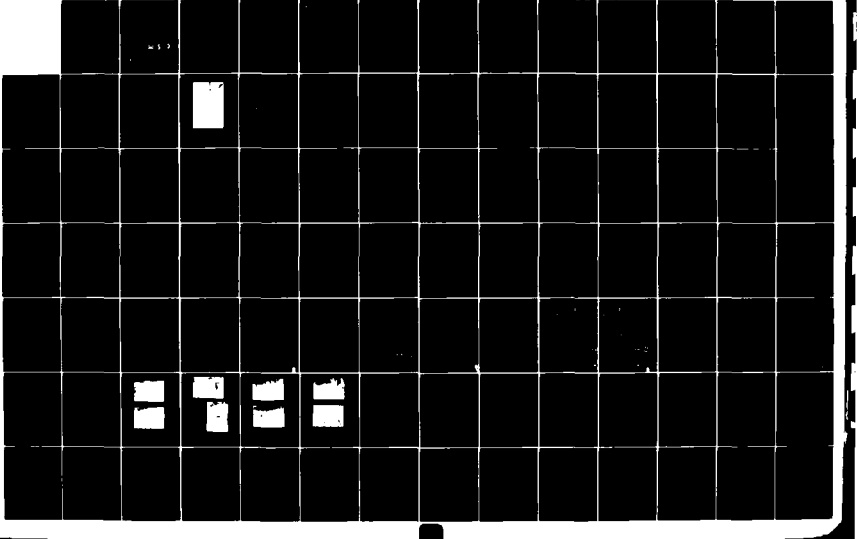

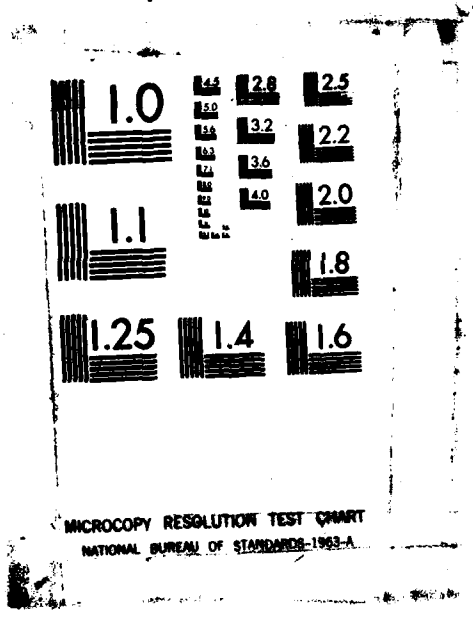
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MASSACHUSETTS COASTAL BASIN
ARLINGTON - LEXINGTON, MASSACHUSETTS

ARLINGTON RESERVOIR DAM
MA 00771

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JULY 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00771	2. GOVT ACCESSION NO. AD-A155451	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Arlington Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE July 1981 13. NUMBER OF PAGES 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Massachusetts Coastal Basin
Arlington-Lexington, Massachusetts
Mill Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is an earth embankment with a concrete and rubble masonry overflow spillway located near the center of the dam. The dam is considered to be in poor condition. It is small in size with a high hazard potential. It is recommended to prepare a written procedure for dam operation during flood events, cease and desist from dumping material on the dam slopes and crest immediately among other recommendations.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

SEP 08 1981

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Arlington Reservoir Dam (MA-00771) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Arlington Reservoir Dam would likely be exceeded by floods greater than 23 percent of the Probable Maximum Flood (PMF). Our screening criteria specifies that a dam classified as high hazard with a spillway capacity insufficient to discharge fifty percent of the PMF be judged as having a seriously inadequate spillway. As a result this dam is assessed as unsafe, non-emergency until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as it would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

We recommend that within twelve months from the date of this report the owner of the dam engage the services of a qualified registered engineer to determine further the potential of overtopping the dam and the need for and the means to increase project discharge capacity. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed and round-the-clock surveillance should be provided during periods of heavy precipitation or high project discharge.

SEP 0 8 1981

NEDED
Honorable Edward J. King

I approve the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the program.

Copies of this report have been forwarded to the Department of Environmental Quality Engineering and to the owner, Town of Arlington, Arlington, MA. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Quality Engineering for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

ARLINGTON RESERVOIR DAM

MA 00771

MASSACHUSETTS COASTAL BASIN

ARLINGTON - LEXINGTON, MASSACHUSETTS

PHASE 1 INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 INSPECTION REPORT

IDENTIFICATION NO.:		MA 00771
NAME OF DAM	:	ARLINGTON RESERVOIR DAM
TOWNS	:	ARLINGTON & LEXINGTON
COUNTY AND STATE	:	MIDDLESEX, MASSACHUSETTS
STREAM	:	MILL BROOK
DATE OF INSPECTION:		DECEMBER 8, 1980

BRIEF ASSESSMENT

The Arlington Reservoir Dam is an earth embankment with a concrete and rubble masonry overflow spillway (emergency spillway) located near the center of the dam. A concrete sluiceway (principal spillway), located approximately 20 ft. to the left of the emergency spillway, consists of a 9 ft. wide crest gate flowing to a 5 ft. diameter concrete pipe which outlets into Mill Brook. A low level outlet consists of a pipe of approximately 12 inches diameter controlled by a gate valve which is located in a chamber at the downstream slope of the dam 800 ft. to the left of the sluiceway. The embankment has a minimum top width of approximately 20 feet, a maximum height of 14 feet and upstream and downstream slopes a minimum 1.5 H to 1 V. The overall length of the dam is approximately 1770 ft.

The dam impounds Arlington Reservoir, a recreational and flood control reservoir for the Town of Arlington. The reservoir

had at one time been used as a water supply for the Town of Arlington, but is no longer used for this purpose.

Based on visual inspection and a review of all available pertinent data, the dam is considered to be in poor condition. Features that could effect the structural integrity of the dam include erosion and slumping of dam slopes, extensive tree growth on the dam slopes, deterioration of emergency spillway discharge channel, deterioration of the gate chamber for the low level outlet.

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as "Small" in size, with a "High" hazard potential. A Test Flood equal to one-half of the Probable Maximum Flood (1/2 PMF) was selected in accordance with the Corps of Engineers' Guidelines. The calculated Test Flood outflow from the reservoir was 850 cfs. The Test Flood would overtop the dam by approximately 0.9 feet. About 600 cfs or 70% of the Test Flood outflow would be carried by the sluiceway and the emergency spillway.

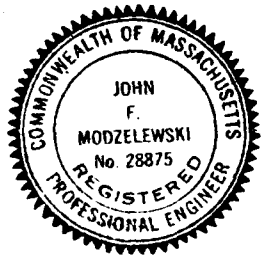
Recommendations include the following: prepare a written procedure for dam operation during flood events, cease and desist from dumping material on the dam slopes and crest immediately, remove all dumped material from the downstream slope of the dam immediately; engage the services of a qualified registered engineer to specify and oversee the following: procedures for the construction of adequate erosion protection, the removal of trees

and root systems on and near the embankment, the reinforcing of the gate chamber, investigate the cause of wet areas at the toe of dam embankment and investigate the seismic stability of the dam.

Perform a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam and the need for and the means to increase project discharge capacity. Technical inspections by a qualified, registered engineer should be performed every year; the entire dam should be inspected visually once a month; and a formal downstream warning system should be put into effect.

The owner should implement the recommedations and remedial measures as described herein and in greater detail in Section 7 of the Report within 1 year after receipt of this Phase I Inspection Report, except as otherwise noted.

ASEC CORPORATION



John F. Modzelewski P.E.
Project Engineer/
Director of Engineering Services

This Phase I Inspection Report on Arlington Reservoir Dam (MA-00771) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase 1 Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase 1 Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase 1 investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect

to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase 1 inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase 1 Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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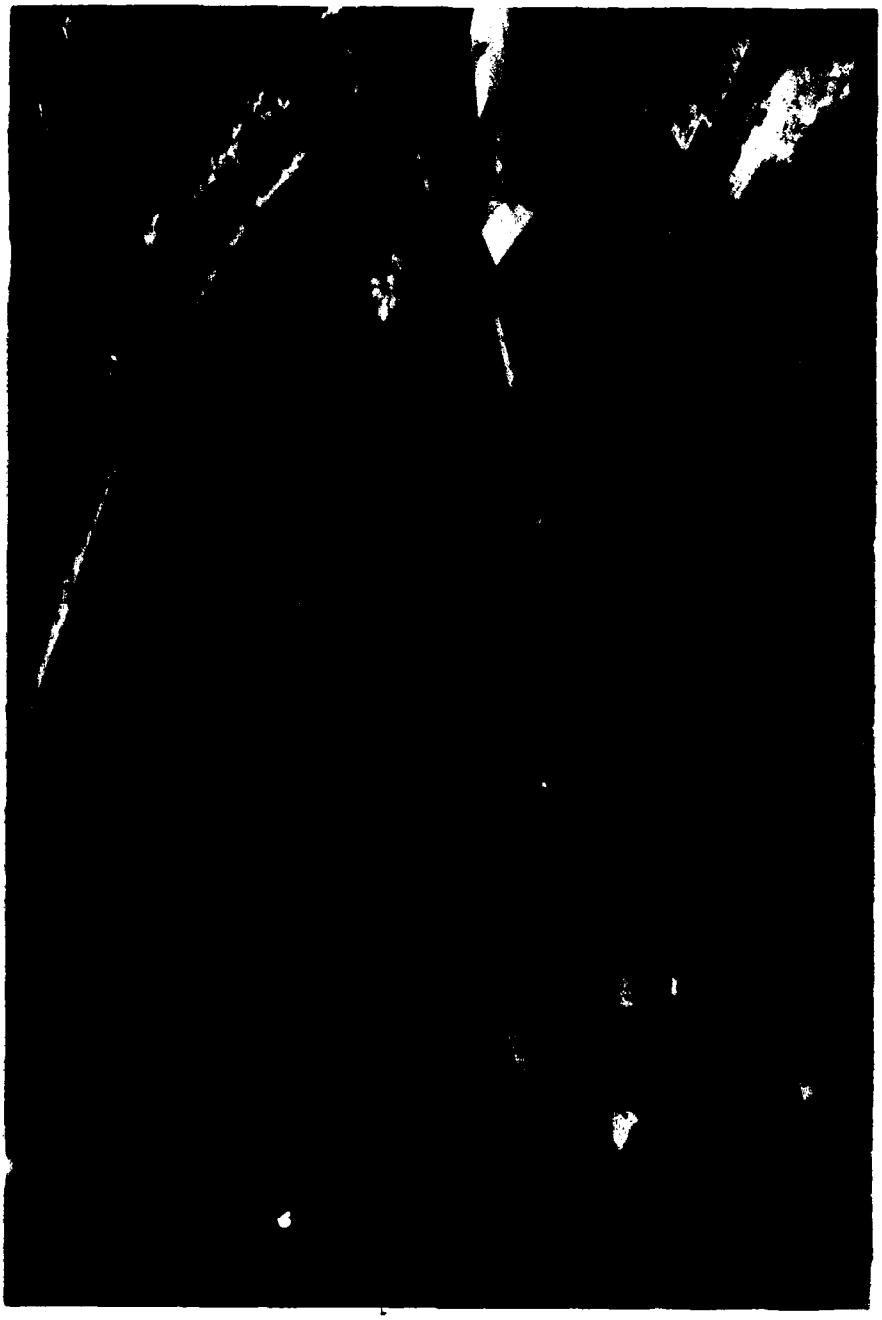
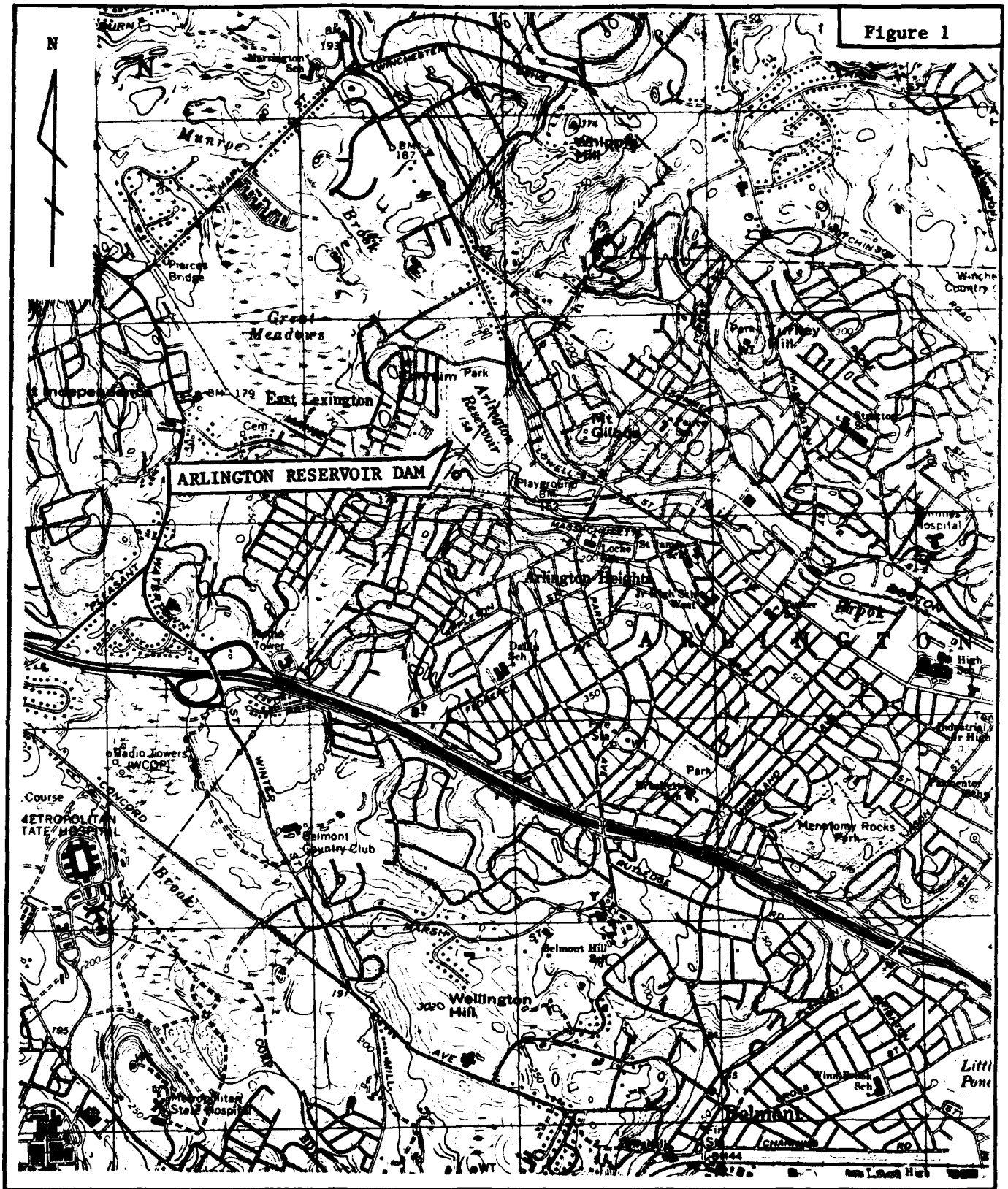
APPENDIXES



OVERVIEW PHOTO

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM , MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	ARLINGTON RESERVOIR DAM TR. TO MILL BROOK ARLINGTON & LEXINGTON MASSACHUSETTS MA 00771 DECEMBER 10, 1980
ASEC CORP. CONSULTING ENGINEERS BOSTON , MASSACHUSETTS		

Figure 1



LOCATION PLAN

ARLINGTON RESERVOIR DAM
ARLINGTON & LEXINGTON, MASSACHUSETTS

SCALE: 1 : 25000

ASEC CORPORATION

LEXINGTON QUADRANGLE 1978

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 INSPECTION REPORT

PROJECT INFORMATION

SECTION 1

1.1 GENERAL

a. AUTHORITY

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. ASEC Corporation has been retained by the New England Division to inspect and report on selected dams in the state of Massachusetts. Authorization and notice to proceed were issued to ASEC Corporation under a letter of December 8, 1980, from William E. Hodgson, Colonel, Corps of Engineers. Contract No. DACW33-81-C-0023 has been assigned by the Corps of Engineers for this work.

b. PURPOSE OF INSPECTION

The purposes of the program are to:

I. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

II. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.

III. To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

a. LOCATION

The dam is located between Lowell Street and the Boston and Maine Railroad Tracks on the town lines of Arlington and Lexington, Massachusetts. The dam is located on Munroe Brook, it outlets to Mill Brook which runs along the downstream toe the dam. The dam is shown on the Lexington Quadrangle Map having coordinates latitude 42°-25.6 ' and longitude 71°-11.4' (See Figure 1).

b. DESCRIPTION OF DAM AND APPURTENANT STRUCTURES

The dam consists of an earth embankment. The embankment has a minimum top width of approximately 20 feet, a maximum height of about 14 feet and upstream and downstream slopes ranging from a minimum 1.5 H to 1 V. to 2.5 H to 1 V. The overall length of the dam is approximately 1770 ft. including a 15 ft. wide emergency spillway with a concrete crest located near the center of the dam. A concrete sluiceway (principal spillway) containing a crest gate flowing to a 5 ft. diameter concrete pipe is located approximately 20 ft. to the left of the emergency spillway. The crest gate elevation can be varied between El.153 and El.159. It is raised or lowered by a worm drive mechanism. A section through this device is included in Appendix B page B-3. A chain link fence about 6 ft.

high surrounds the intake channel and crest gate area of the sluiceway. A pipe approximately 12 inches in diameter controlled by a gate valve serves as a low level outlet for the dam. This valve is located in a chamber approximately 800 feet to the left of the sluiceway.

c. SIZE CLASSIFICATION - "Small"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Small" in size if the height is between 25 and 40 feet, or the dam impounds between 50 and 1000 acre-feet. The dam has a maximum height of 14 feet and a maximum storage capacity of 480 acre-feet. Therefore the dam is classified as small in size based on storage capacity.

d. HAZARD CLASSIFICATION -"High"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the Hazard Classification for the dam is "High". The dam is classified as a "High" Hazard Potential structure because it is located in a predominantly urban area where failure or misoperation of the dam may result in the loss of more than a few lives and excessive economic losses. Post-failure flooding will range 3 - 7 ft. higher than pre-failure flooding, and effect over 100 structures. See Appendix D for failure analysis.

e. OWNERSHIP

Former Owner : Unknown

Present Owner : Town of Arlington
c/o Town Manager
Arlington Town Hall
730 Massachusetts Avenue
Arlington, MA 02174
(617) 643-6700

f. OPERATOR

Mr. Richard Bowler, Director
Arlington Department of Public Works
730 Massachusetts Avenue
Arlington, MA 02174
(617) 643-6700

g. PURPOSE OF DAM

The dam impounds Arlington Reservoir, a recreational and flood control reservoir for the town of Arlington. The maximum storage capacity for flood control purposes is approximately 155 acre-feet. The reservoir had at one time been used as a water supply for the Town of Arlington, but is no longer used for this purpose.

h. DESIGN AND CONSTRUCTION HISTORY

There is no known history of the original design and construction of the dam. The original dam was probably completed prior to 1900. In 1957 a new concrete sluiceway was designed by Howard M. Turner, Consulting Engineer. These plans are included in Appendix B. The general contractor for the construction of the sluiceway was reported to be T N T Construction Company. No "As-built Plans" are known to exist for this dam.

i. NORMAL OPERATIONAL PROCEDURES

The crest gate on the new sluiceway is raised or lowered depending upon flood control and recreational needs by Arlington Department of Public Works employees. The need for raising the crest gate is determined by monitoring the Mill Brook downstream of the dam near an apartment complex at Lowell Street.

1.3 PERTINENT DATA

a. DRAINAGE AREA

The drainage area consists of 2.36 square miles of urbanized rolling hills surrounding a marshy stream valley. The hills rise to about 250 ft. above mean sea level. See the Watershed Map in Appendix D.

b. DISCHARGE AT DAMSITE

The discharge at the damsite is through two structures: a concrete sluiceway (principal spillway) which consists of a 9 ft. wide crest gate that spills into a 5 ft. diameter concrete pipe (sluiceway outlet), and an emergency spillway 15 ft. wide. The crest gate is movable and can be adjusted from elevation 153.0 to 159.0 NGVD. (A section showing this crest gate is included as page B-3 in Appendix B.) The emergency spillway consists of a concrete weir set in a 15 ft. wide rubble masonry channel, the weir can accept flashboards but none are in use at the site. A third, low level outlet consists of a pipe of approximately 12 inches diameter controlled by a gate valve in a chamber on the downstream slope of the dam.

NGVD = National Geodetic Vertical Datum

1.	Outlet Works (conduit) Size:	12 inch diameter
	Invert Elevation:	147 ft.$\pm$ at outlet
	Discharge Capacity	12 cfs at El. 159 NGVD
2.	Maximum Known Flood at Damsite:	Unknown

3.	Ungated Spillway Capacity at Top of Dam	
	Principal Spillway (Sluiceway)#	300 cfs
	Emergency Spillway	250 cfs
	Elevation	162.0 ft.
4.	Ungated Spillway Capacity at Test Flood Elevation	
	Principal Spillway (Sluiceway)#	300 cfs
	Emergency Spillway	350 cfs
	Elevation	162.9 ft.
5.	Gated Spillway Capacity *	
	Water at Top of Dam	150 cfs
	Elevation	162.0 ft.
6.	Gated Spillway Capacity * at Test Flood Elevation	200 cfs
	Elevation	162.9 ft.
7.	Total Spillway Capacity at Test Flood Elevation	
	Crest Gate up - El. 159.0 ft.	600 cfs
	Crest Gate down - El. 153.0 ft.	700 cfs
	Elevation	162.9 ft.
8.	Total Project Discharge at top of Dam	
	Crest Gate up - El. 159.0 ft.	400 cfs
	Crest Gate down - El. 153.0 ft.	550 cfs
	Elevation	162.0 ft.
9.	Total Project Discharge at Test Flood Elevation	
	Crest Gate up - El. 159.0 ft.	850 cfs
	Crest Gate down - El. 153.0 ft.	1100 cfs
	Elevation	162.9 ft.

c. ELEVATION - Feet above National Geodetic Vertical Datum

1.	Streambed at toe of dam	148.0
2.	Bottom of Cutoff	N/A
3.	Maximum Tailwater	N/A
4.	Normal Pool	Varies - 159.0 Maximum 153.0 Minimum
5.	Full Flood Control Pool	162.0
6a.	Principal Spillway Crest	
	Gate up	159.0
	Gate down	153.0

- Crest gate at El. 153.0 NGVD * - Crest gate at El. 159.0 NGVD

6b.	Emergency Spillway Crest	159.0
7.	Design Surcharge-Original Design	Unknown
8.	Top of Dam	162.0
9.	Test Flood Surcharge	162.9
d.	RESERVOIR - Length in Feet	
1.	Normal Pool	2,300
2.	Flood Control Pool	3,600
3.	Spillway Crest Pool	2,300
4.	Top of Dam	3,600
5.	Test Flood Pool	4,400
e.	STORAGE - Acre-feet	
1.	Normal Pool	325
2.	Flood Control Pool	480
3.	Spillway Crest Pool (Emergency spillway)	325
4.	Top of Dam	480
5.	Test Flood Pool	560
f.	RESERVOIR SURFACE - Acres	
1.	Normal Pool	40
2.	Flood Control Pool	65
3.	Spillway Crest	40
4.	Test Flood Pool	75
5.	Top of Dam	65

g.	DAM	
1.	Type	Earth embankment
2.	Length	1770 feet
3.	Height	14 feet
4.	Top Width	Varies 20 ft. minimum
5.	Side Slopes	
	Upstream	Varies vertical to 2+ H : 1 V
	Downstream	Varies 1.5 H : 1 V to 2.5 H : 1 V
6.	Zoning	Unknown
7.	Impervious Core	Unknown
8.	Cutoff	2" T&G wood, bottom El. 145 NGVD at Sluiceway only *
9.	Grout Curtain	N/A
10.	Other	N/A
h.	DIVERSION AND REGULATING TUNNEL	N/A
i.	SPILLWAYS	
	Emergency Spillway:	
1a.	Type	Concrete lip
2a.	Length of Weir	15.0 feet
3a.	Crest Elevation (feet NGVD)	159.0
4a.	Gates	none
5a.	Upstream channel	Stone masonry
6a.	Downstream channel	Stone masonry
7a.	General	Portion of left upstream wall collapsed

* Indicated on design drawings, not observed in field inspection.

Principal Spillway (Sluiceway):

1b. Type	Steel crest gate
2b. Length of Weir	9.0 feet
3b. Crest Elevation (feet NGVD)	Varies 153.0 to 159.0
4b. Gates	One steel crest gate
5b. Upstream channel	Concrete
6b. Downstream channel	Flows into 5 ft. diameter concrete pipe and exits to natural stream
7b. General	Invert of upstream end of pipe El. 149.0 ft. NGVD

j. REGULATING OUTLETS

1. Invert	147.0 ft. (Approx.)
2. Size	12 inch diameter cast iron pipe
3. Description	Low level outlet for reservoir.
4. Control Mechanism	Gate valve in downstream slope of dam.
5. Other	Capacity 12 cfs at El. 159.0 NGVD

ENGINEERING DATA

SECTION 2

2.1 DESIGN DATA

Design data consisted of the plans for the new sluiceway and gate for the dam, dated June 1957, by Howard M. Turner, Consulting Engineer. These plans are included in Appendix B. These documents contain the principal information regarding the design reviewed in the preparation of this report.

2.2 CONSTRUCTION DATA

No construction data was available for review. The name of the contractor responsible for construction was T N T Construction Company.

2.3 OPERATIONAL DATA

A log of the elevation of the crest gate is kept by the Arlington Department of Public Works. The gate is raised during heavy rainfall depending upon downstream conditions of the Mill Brook. The Mill Brook is monitored at an apartment complex at Lowell Street immediately downstream of the dam.

2.4 EVALUATION OF DATA

a. AVAILABILITY

Data was provided by the Town of Arlington. A list of the available reference material and their location is given in Appendix B.

b. ADEQUACY

The lack of engineering data did not allow for a

definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history, hydraulic and hydrologic calculations and sound engineering judgment.

c. VALIDITY

Field inspections and surveys indicate that the observed portion of the sluiceway and spillway were constructed substantially in accordance with the design drawings reviewed.

VISUAL INSPECTION

SECTION 3

3.1 FINDINGS

a. GENERAL

The visual inspection of the dam was conducted on December 8, 1980. At the time of inspection the level of the reservoir was approximately El. 153.0 NGVD or approximately 6.0 feet below the emergency spillway elevation. The general condition of the dam at the time of inspection was poor.

b. DAM

The dam consists of an earthen embankment. The crest of the dam, the downstream slope, and portions of the upstream slope are covered with a growth of grass, weeds, brush and trees up to 32 inches in diameter. (Overview photo)

There is some riprap on the upstream slope to an elevation 1 to 2 feet below the crest of the dam to some unknown elevation beneath the level of the reservoir at the time of inspection. The riprap is in very poor condition. There are several large erosion gullies up to 2 feet deep and 18 feet wide on the upstream face extending from the crest of the dam to the level of the reservoir (Photo #1). Undercutting of the slope up to 2 ft. high is evident in photo #2. Erosion and slumping has occurred adjacent to the sluiceway wing walls. (Photo #3)

The crest of the dam is a roadway which is bare of vegetation with extensive tree growth on both the upstream and downstream edges of the crest. Brush and trees have been cut and left lying on the crest to the left of the sluiceway. The area is being used as a dumping area for the Town Department of Public Works. Because of the extensive piles of cut brush, leaves, trees, and soil, it is not possible to adequately inspect the embankment at these locations. For the location of the dumping areas please see the plan of the dam in Appendix B page B-1.

The downstream slope ranges from approximately 1.5 H : 1 V to 2.5 H : 1 V and is heavily overgrown with trees up to 2 feet diameter. Erosion of the slope has occurred in many locations (Photo #4). There is no apparent seepage on the slope. Standing water downstream of the dam to the right of the sluiceway structure makes it difficult to observe any apparent seepage at and downstream of the toe. The Mill Brook flows along the toe of the dam to the left of the sluiceway structure and has caused erosion and slumping along the toe of the slope.

c. APPURTENANT STRUCTURES

The outlet works consist of concrete wing walls leading to a 9 ft. wide crest gate that is adjustable in height by a manually operated worm drive mechanism above the gate (Photo #5). This gate is reported to be operable. Appendix B page B-3 shows a cross-section of this gate. At the time of inspection there was some brush in the sluiceway channel. At the time of inspection the gate and wingwalls were in good condition. The water flows from

the gate into a 5 ft. diameter concrete pipe which empties into the Mill Brook. The condition of the concrete pipe could not be observed. The outlet structure for the pipe consisted of a concrete headwall with a trash rack. There was minor cracking and efflorescence evident in the headwall (Photo #6).

The emergency spillway consisted of an approach channel of stone masonry walls and floor leading to a concrete spillway and a discharge channel of stone masonry walls and floor. The left approach channel wall is collapsed near the sluiceway wingwall (Photo #7). The approach channel floor is covered with leaves and branches. The discharge channel has trees and brush growing through the masonry floor of the channel (Photo #8). The concrete weir is in fair condition. The training walls at the weir are of concrete. No major wall displacement was evident at the weir.

A service bridge over the emergency spillway was in poor condition (Photo #7). The bridge was unpainted, portions of the railings were bent, corrosion was evident at welded joints. The expanded metal used for decking was warped.

The gate valve and outlet pipe for the low level outlet was observed. The low level outlet was reported to be a 12" cast iron pipe however the outlet observed was a 15" diameter reinforced concrete pipe (RCP). It was reported that the 12" diameter pipe was extended at one time using 15" RCP. No flow was observed

from this pipe at the time of inspection. The gate valve was housed in a chamber with two other valves on the downstream slope of the dam. The valve was reported to be operable. This chamber, once a brick building, has been buried in brush and other debris and now entrance is gained through a manhole in the roof. The brick chamber walls were bulging inward at the bottom of the structure.

Nearby to the 15" RCP was another pipe - a 30" diameter RCP. This pipe was reported to be part of a storm drainage system. The location of this pipe in relation to the dam is unkown. No flow was observed from this pipe at the time of inspection.

d. RESERVOIR AREA

No evidence of significant sedimentation of the reservoir was observed.

e. DOWNSTREAM CHANNEL

The downstream channel for the emergency spillway and sluiceway is Mill Brook which is a broad channel with trees lining both sides of the channel. For approximately 500 feet below the sluiceway, the stream is in contact with the toe of the dam.

3.2 EVALUATION

On the basis of the visual inspection the dam is judged to be in poor condition. The future integrity of the dam can be affected by the following:

The extensive tree growth on the dam represents a risk of damage due to trees uprooting during storms or to potential seepage along the extensive root paths.

Erosion gullies along the upstream and downstream slopes could contribute to possible breaching if the dam were overtopped.

The dumping areas for cut brush, leaves, trees and soil on the crest of the dam and along a portion of the downstream slope makes it impossible to adequately inspect the embankment at these locations.

The riprap on the upstream slope of the dam is in such poor condition as to provide no erosion protection for the upstream face of the dam.

Due to the lack of grass cover on the crest, the dam may be susceptible to erosion should the dam be overtopped.

The contact of the Mill Brook with the downstream toe of the dam will contribute to continued erosion and slumping of the slope.

Ponding of water along the toe of the downstream slope makes it difficult to observe any apparent seepage at or near the toe.

The trees and brush growing in and along the discharge channel for the emergency spillway will cause dislocation of the stone masonry weakening the walls and floor as well as impairing the hydraulics of the channel.

The service bridge is hazardous to use at present and may eventually collapse making it difficult to traverse the emergency spillway.

The gate chamber for the low level outlet may eventually collapse due to the imposed load of the backfilling against it, making use of the low level outlet impossible.

The 15" RCP reported to be the low level outlet is located in such a position as to make this report questionable.

The location of the 30" RCP in relation to the dam is unknown. If the pipe is in the dam embankment, it may provide a path for internal erosion of the dam.

Since the gate valve for the low level outlet is on the downstream slope of the dam, a portion of the pipe is under pressure. Should the pipe break upstream of the valve, erosion of the dam embankment along the pipeline could occur; also repair of the pipe would be difficult.

OPERATIONAL AND MAINTENANCE PROCEDURES

SECTION 4

4.1 OPERATIONAL PROCEDURES

a. GENERAL

The dam is used primarily for recreational and flood control purposes. There is a bathing beach located at the reservoir. In the past the water impounded by this dam was used as a water supply for parts of the Town of Arlington.

The crest gate for the sluiceway is used to regulate the surface water elevation of the reservoir. It is regulated by the Town of Arlington Department of Public Works. A log is kept of the current height of the crest gate for reference in the town yard. The elevation of the reservoir varies depending upon recreational and flood control needs.

The low level outlet is used to draw the reservoir lower than the crest gate level for maintenance of the sluiceway and crest gate.

b. DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no formal warning system in effect. During storms the reservoir is monitored indirectly and its outflow then adjusted by means of monitoring the flow in Mill Brook at an apartment complex at 180 Lowell Street.

4.2 MAINTENANCE PROCEDURES

a. GENERAL

The dam is observed on at least a monthly basis by the Arlington Department of Public Works. The observations are generally confined to the sluiceway area of the dam. The

responsibility for maintenance of the dam lies with the Arlington Department of Public Works. This maintenance is generally limited to removing trash accumulated in the area of the crest gate. The dam is not patrolled.

b. OPERATING FACILITIES

The crest gate and the gate valve for the low level outlet are the operational portions of this dam requiring maintenance. The crest gate is inspected at least monthly and maintained as required.

4.3 EVALUATION

Present operational procedures should be modified to include establishment of a formal downstream warning system: The dam is monitored during periods of heavy rainfall presently, however a formal procedure for notifying downstream authorities in the event of an emergency should be prepared.

Present maintenance and inspection procedures are inadequate. Written inspection and maintenance procedures should be prepared and instituted.

Annual technical inspections by a qualified, registered engineer should be instituted.

Conflicts between the flood control and recreational use of this dam may arise. Operational procedures should be prepared and instituted which govern the operation of the crest gate directly preceding and during flood events.

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

SECTION 5

5.1 GENERAL

Arlington Reservoir Dam is located in a highly urbanized area on the town lines of Arlington and Lexington, Massachusetts. Its outlet flows into Mill Brook which has its headwaters in Great Meadows. The downstream area of Arlington Reservoir is also highly urbanized with the Mill Brook Floodplain seriously encroached upon. The drainage area above the dam consists of 2.36 square miles of urbanized rolling hills surrounding a marshy steam valley. The hills rise to about 250 ft. above mean sea level.

The outlet structures of Arlington Reservoir Dam consist of a sluiceway (principal spillway) and an emergency spillway. The sluiceway consists of a crest gate that may be adjusted from El. 153.0 to 159.0 NGVD. For the purposes of this study the worst possible condition was assumed, placing the gate at elevation 159.0 NGVD. The emergency spillway is a concrete weir set at elevation 159.0 NGVD.

5.2 DESIGN DATA

A set of drawings dated June 1957 by Howard M. Turner Consulting Engineer depicting a new sluiceway and modifications to the emergency spillway crest were the only design documents available for this report.

5.3 EXPERIENCE DATA

No written records of historical floods were available for this report. However a conversation with the Arlington Department

of Public Works indicates that the dam was overtopped at one time in the 1950's. High water marks on the sluiceway wingwalls indicate a maximum water elevation of approximately 159 ft. NGVD.

A C.E. Maguire hydraulic/hydrologic analysis of Mill Brook for the Corps of Engineers dated 1978 provides a detailed analysis for two large magnitude storms. According to this report, the Standard Project Flood and the August 1955 storm of record are both apparently passed without overtopping of the dam. The maximum outflow expected was about 170 cfs.

5.4 TEST FLOOD ANALYSIS

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the size of the dam is small. Based on dam failure analysis and the above Guidelines the dam is classified as "High" hazard potential.

Based on the Corps of Engineers guidelines the Test Flood should be in the range of 1/2 of the Probable Maximum Flood (PMF) to PMF. Since the size of the reservoir is average and the height is low for its size classification, a test flood equal to 1/2 PMF was selected. The 1/2 PMF was estimated using the Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase 1 Dam Safety Investigations" dated March 1978. Since the dam is in the eastern Massachusetts region, the flat curve of the Maximum Probable Peak Flow Rates graph was used,

giving a PMF of 900 cfs/square mile. For the drainage area of 2.4 square miles, the 1/2 PMF inflow is 1050 cfs. Stage-storage relationships were developed for Arlington Reservoir and the test flood was routed through the reservoir using techniques from the Corps of Engineers guidelines. For the purposes of this study the crest gate was assumed to be at El. 159.0, the worst case condition. The test flood outflow of 850 cfs overtopped the dam at an elevation of 162.9 ft. NGVD which is approximately 0.9 ft. above the dam crest. The spillways cannot pass a flood of magnitude 1/2 PMF. They pass approximately 600 cfs or 70% of the test flood outflow at the top of dam.

5.5 DAM FAILURE ANALYSIS

A dam failure analysis was made using the "Rule of Thumb Guidance" provided by the Corps of Engineers. Failure was assumed with water level at the top of the dam, El. 162.0 ft. NGVD. Damage associated with this failure would be extremely severe with a loss of more than a few lives expected. In the 1.3 miles of study, the flood wave would inundate over 100 structures with 3 - 7 ft. of flooding. The total attenuation of the flood wave is not expected to occur until it reaches Lower Mystic Lake, 2.8 miles downstream of Arlington Reservoir. Thus further damage would be expected in the remaining 1.5 miles to the Lower Mystic Lake.

Table 1 summarizes the results of the dam failure analysis. Based on this analysis and Corps of Engineers' guidelines, the dam is classified as having a "High" hazard potential: a breach of the dam may damage over 100 homes and potentially cause the loss of more than a few lives. The dam breach calculations and a description of potential flooding is included in Appendix D.

The table below summarizes the downstream effects of failure of Arlington Reservoir Dam

Location No. (See Map)	Distance D/S of Dam (ft.)	Number of Structures	Level Above Stream (ft.)	Flow (cfs) Stage (ft. above stream) Before Failure	Flow (cfs) Stage (ft. above stream) After Failure	Comments
1	10-1240	6 Apartment buildings	5	622/6.3	9283/9.9	Significant danger to l
2	1240-2400	8 Apartment buildings 41 Commercial/ Residential 3 Roadways	3 - 8	622/4.9	8455/8.2	Great dange to life
3	2400-3720	7 Commercial Structures 2 Residences 2 Roadways	2 - 10	622/3.4	7848/10.65	Great dange to life
4	3720-4710	6 Commercial Structures 36 Residences 3 Roadways	6 - 12	622/4.9	7351/12	Great dange to life
5	4710-6870	12 Commercial Structures 14 Residences 3 Apartment buildings 5 Roadways	6 - 8	622/3.9	6610/8.4	Great dange to life

Table 1 - Summary of Downstream Flooding

EVALUATION OF STRUCTURAL STABILITY

SECTION 6

6.1 VISUAL OBSERVATIONS

The visual inspection disclosed several indications of instability at this dam: the collapsed portion of the emergency spillway approach channel, the bulged section of brick wall at the gate valve chamber for the low level outlet, erosion of the downstream toe of the dam to the left of the emergency spillway structure.

6.2 DESIGN AND CONSTRUCTION DATA

There was no known design and construction data for the dam at the time of inspection. The only design data was for the sluiceway. There was no construction data for the project.

Adequate information is not available to permit an in depth stability analysis of the dam.

6.3 POST CONSTRUCTION CHANGES

The outlet and emergency spillway structures were reconstructed according to two design drawings dated June 1957. It is not possible to determine on the basis of the visual inspection whether changes to the dam were actually constructed as shown on the drawings. The log boom at the sluiceway shown on the plans was not found in the field.

6.4 SEISMIC STABILITY

The dam is located in Seismic Zone No. 3. Phase 1 Guidelines recommend, as a minimum, that suitable analysis made by conventional equivalent static load methods should be on record for dams in Zone 3. As far as can be determined, no such analysis has been made.

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

SECTION 7

7.1 DAM ASSESSMENT

a. CONDITION

On the basis of the visual inspection and the available plans the dam is judged to be in poor condition. The following conditions can effect the long term performance of the dam:

1. The widespread slumping, erosion and displacement of riprap on the upstream slope of the dam could lead to additional erosion of the upstream slope.

2. The extensive tree growth on the dam represents a risk of damage due to trees uprooting during storms or to seepage along the root system.

3. Lack of erosion protection on the crest of the dam could result in erosion and possible breaching if the dam were overtopped.

4. Erosion and slumping of the downstream slope and erosion of the toe along the left side of the dam could contribute to instability of the slope.

5. Ponding of water along the toe of the dam to the right of the spillway may be the result of seepage and piping along the toe of the dam. If such piping exists, it could contribute to the breaching of the dam.

6. Trees and brush in the emergency spillway discharge channel will cause further deterioration of the channel.

7. The gate valve chamber may eventually collapse due to the imposed load on it.

8. Spillways at the dam are cannot pass the Test Flood.

9. The dumped material on the crest and downstream slope make proper inspection of the dam impossible.

b. ADEQUACY OF INFORMATION

The information obtained from the design drawings and the results of the visual inspection are adequate for the purposes of this Phase 1 Inspection.

c. URGENCY

The recommendations presented in Sections 7.2 and 7.3 should be carried out within one year of receipt of this report by the owner except as otherwise noted.

7.2 RECOMMENDATIONS

The following recommendations should be carried out under the direction of a qualified, registered engineer.

1. Specify and oversee construction of adequate erosion protection for the dam slopes and crest. Repair existing eroded areas.

2. Specify procedures for removing the trees and root systems on the embankment and within 25 ft. of the toe. Oversee the backfilling operation with suitable materials.

3. Investigate the cause of the wet area at the toe of the embankment to the right of the spillway channel and design and oversee construction of remedial measures, if required.

4. Investigate, design and implement a means of erosion protection along the toe of the embankment adjacent to Mill Brook. The investigation should consider the alternative of relocating Mill Brook in the vicinity of the dam.

5. Investigate the seismic stability of the dam.

6. Specify procedures for removing trees and brush in the emergency spillway channel and oversee the backfilling operation with suitable materials.

7. Design and oversee construction of suitable reinforcement of the gate valve chamber for the low level outlet.

8. Design and oversee repairs to the emergency spillway's left channel wall.

9. Perform a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam and the need for and the means to increase project discharge capacity.

10. Design and oversee construction of an upstream shutoff for the low level outlet pipe.

11. Prepare a plan of all pipes and other structures within the vicinity of the dam embankment which may provide seepage paths through the dam.

12. Prepare a written procedure for operating the crest gate during flood events.

13. Evaluate the need for repair of the existing service bridge over the emergency spillway.

7.3 REMEDIAL MEASURES

a. OPERATING AND MAINTENANCE PROCEDURES

1. Cease and desist dumping debris on the dam crest and slopes immediately.

2. Immediately remove all dumped material brush, leaves, trees and debris the downstream slope of the dam.

3. Remove all dumped material, brush, leaves, trees and debris from the crest of the dam.

4. The dam and appurtenances should be visually inspected once a month.

5. Engage a qualified, registered engineer to make a comprehensive technical inspection of the dam once each year.

6. Establish a downstream warning program to accompany the surveillance program already in existence during and immediately after heavy rainfalls.

7. Prepare and institute written dam maintenance and inspection procedures.

7.4 ALTERNATIVES

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL CHECKLIST WITH COMMENTS

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT ARLINGTON RESERVOIR DAM

DATE DECEMBER 8,1980
TIME 8:30 AM
WEATHER CLEAR,COLD
W.S.EL.153.0 U.S.
149.0 D.S.

PARTY:

1.John F. Modzelewski P.E. ASEC Corporation - Civil/Structural

2.Richard M. Baker Vollmer Associates Inc. - Hydrologist

3.Richard F. Murdock P.E. Geotechnical Engineers Inc.- Geotechnical

4.Richard W. Turnbull Geotechnical Engineers Inc.- Geotechnical

PROJECT FEATURE	INSPECTED BY
1. Dam Embankment	GEI
2. Dike Embankment	None observed
3. Outlet Works - Intake Channel Intake Structure	ASEC, GEI
4. Outlet Works - Control Tower	None observed
5. Outlet Works - Transition & Conduit	ASEC
6. Outlet Works - Outlet Structure & Outlet Channel	ASEC, GEI
7. Outlet Works - Spillway Weir, Approach & Discharge Channels	ASEC, GEI
8. Outlet Works - Service Bridge	ASEC

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

PROJECT FEATURE see below NAME JFM, RFM, RFT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	162.0 NGVD
Current Pool Elevation	153.0 NGVD
Maximum Impoundment to Date	158.5 NGVD (from watermarks)
Surface Cracks	None observed.
Pavement Condition	Unpaved dirt roadway.
Movement or Settlement of Crest	None observed, minor undulations
Lateral Movement	None observed.
Vertical Alignment	Generally obscured by irregularities in upstream and downstream faces.
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Severe erosion on left and right side of intake structure.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	Occasional footpaths and litter indicate trespassing.
Sloughing or Erosion of Slopes or Abutments	Erosion gullys and sloughing common along upstream face, particularly at the upstream edge of the crest.
Rock Slope Protection - Riprap Failures	Many windows in riprap; some beach areas completely unprotected.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	None observed; however, outlet channel runs along toe of downstream face.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.
Toe Drains	None observed.
Instrumentation System	None observed.
Vegetation	Variable density grasses, weeds, brush, and trees

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

PROJECT FEATURE see below NAME --

DISCIPLINE -- NAME --

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	None.
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Natural slopes subject ot wave erosion and gullying.
Bottom Conditions	Under water - appears clear, occasional cobble.
Rock Slides or Falls	None observed.
Log Boom	None
Debris	Brush at crest gate
Condition of Concrete Lining	N/A
Drains or Weep Holes	None observed.
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	None

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

PROJECT FEATURE see below NAME --

DISCIPLINE -- NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	None
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

PROJECT FEATURE see below NAME JFM

DISCIPLINE Civil Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT *	
General Condition of Concrete	Good
Rust or Staining on Concrete	Some staining from fence above walls
Spalling	None - Concrete chipped in places by vandals
Erosion or Cavitation	None observed
Cracking	None observed
Alignment of Monoliths	N/A
Alignment of Joints	N/A
Numbering of Monoliths	N/A

* CONDUIT WAS NOT OBSERVED

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Fair - minor cracks observed, no lateral displacement along cracks
Rust or Staining	Staining due to trash rack
Spalling	None observed - corner of headwall chipped
Erosion or Cavitation	None observed
Visible Reinforcing	None
Any Seepage or Efflorescence	Efflorescence at cracks mentioned above
Condition at Joints	None
Drain holes	None observed.
Channel	Channel unlined; bottom generally earth with scattered cobbles and boulders; partially blocked in places with wooden debris and leaves; minor sloughing and erosion along banks of channel; local areas of near-vertical erosion cuts and undercutting of earth.
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Mortared stone masonry walls in fair condition.
Loose Rock Overhanging Channel	Left wall is partially collapsed leaving cobbles and boulders in approach channel.
Trees Overhanging Channel	None.
Floor of Approach Channel	Covered with leaves and branches.
b. Weir and Training Walls	
General Condition of Concrete	Fair
Rust or Staining	None
Spalling	None
Any Visible Reinforcing	No
Any Seepage or Efflorescence	No
Drain Holes	None observed.
c. Discharge Channel	
General Condition	Walls and floor in fair condition; partially obstructed.
Loose Rock Overhanging Channel	Mortar in walls cracked or missing in places, occasional stone has fallen into channel.
Trees Overhanging Channel	Scattered trees above side walls.
Floor of Channel	Mortared stone masonry floor; cracked in places by trees and root systems.
Other Obstructions	Channel bottom covered with leaves and branches; partially obstructed by brush, saplings, and trees growing in channel.
Other Comments	

PERIODIC INSPECTION CHECKLIST

PROJECT ARLINGTON RESERVOIR DAM DATE Dec. 8, 1980

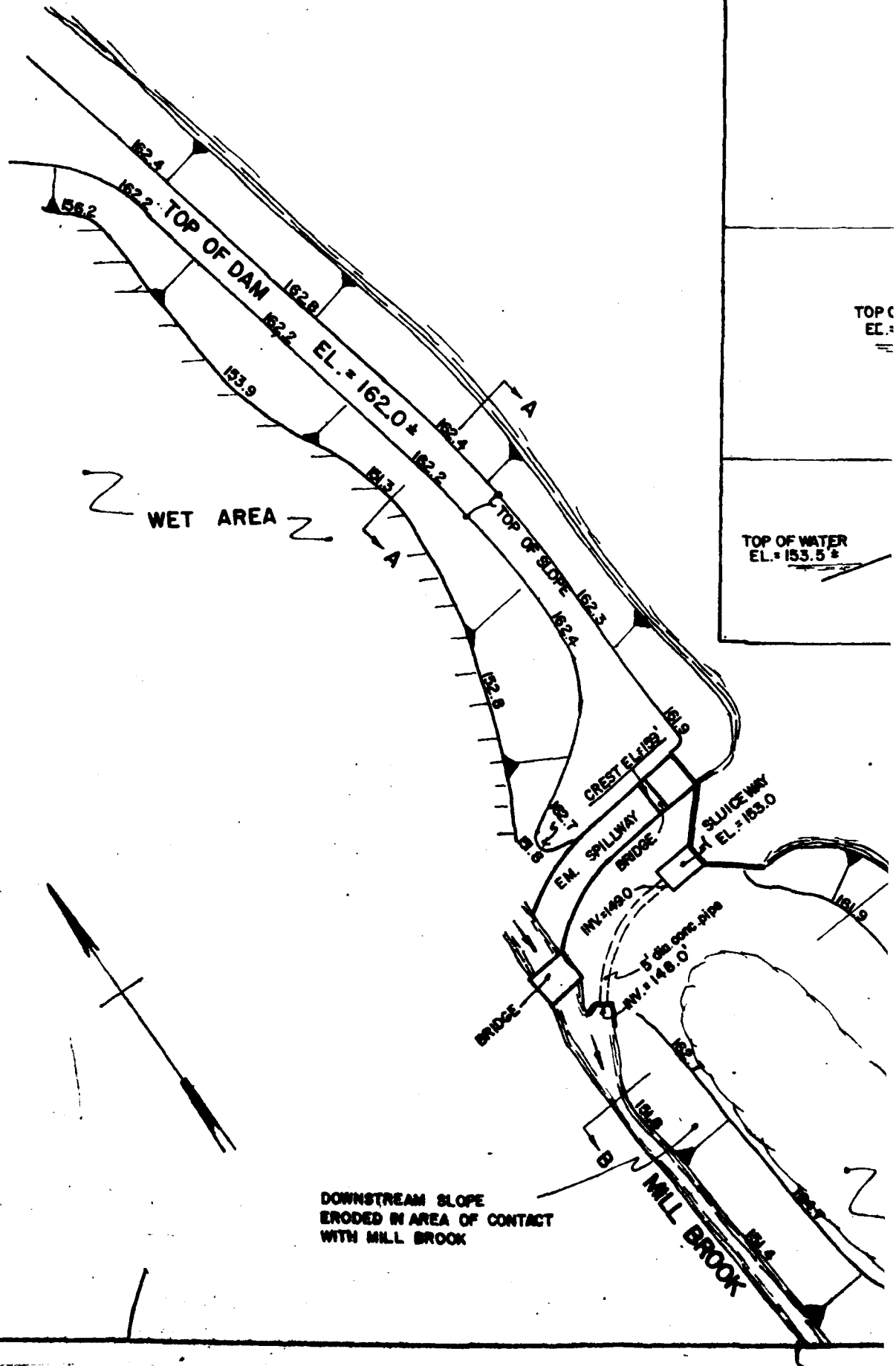
PROJECT FEATURE see below NAME JFM

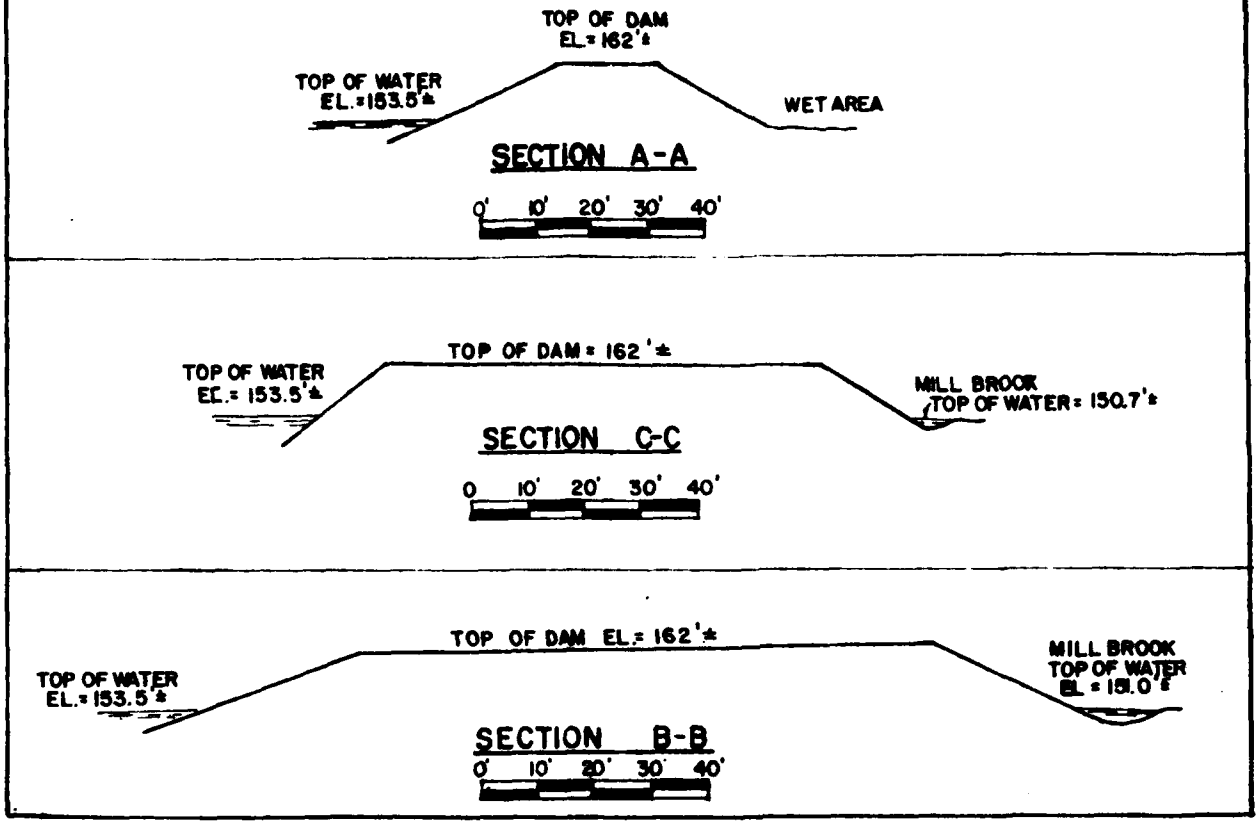
DISCIPLINE Civil Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	
Bearings	None
Anchor Bolts	None observed
Bridge Seat	Spalled in areas
Longitudinal Members	Fair - pitted and unpainted
Underside of Deck	N/A
Secondary Bracing	Poor - corrosion at welded joints
Deck	Expanded metal deck uneven & warped
Drainage System	N/A
Railings	Both pipe railings bent
Expansion Joints	N/A
Paint	Unpainted
b. Abutment & Piers	
General Condition of Concrete & Masonry	Abutment has concrete cap over masonry, concrete spalled on left side, masonry in fair condition.
Alignment of Abutment	Abutments vertical.
Approach to Bridge	N/A
Condition of Seat & Backwall	N/A

APPENDIX B

ENGINEERING DATA


TOP OF DAM EL.= 162.0±
WET AREA
TOP OF SLOPE
TOP OF WATER
EL.= 153.5±
CREST EL.=155'
SLUICEWAY
EL.= 153.0
E.M. SPILLWAY
BRIDGE
INV.=149.0
5' dia. conc. pipe
INV.= 148.0'
BRIDGE
MILL BROOK
DOWNSTREAM SLOPE
ERODED IN AREA OF CONTACT
WITH MILL BROOK
A
A
B
B
162.4
162.2
156.2
162.8
162.2
153.9
162.4
162.2
161.3
162.3
162.4
152.8
161.9
161.9
161.9
162.7
161.8
161.4
162.7



UPSTREAM SLOPE EF
ALONG ENTIRE FACE

ARLINGTON RESERVOIR

SLUICE WAY
EL.= 153.0

B

153.5

161.9

C

SHORE LINE JAN.7, 1981
EL.= 153.5'±

162.3

TOP OF DAM EL.= 162'±

TOP OF SLOPE

30" R.C.P. (STORI

15" R.C.P. (LOW L

162.5

162.8

163.0

TOP OF SLOPE

161.5

150.9

PILES OF FILL & STUMPS

MILL BROOK

161.5

161.2

C

BROOK

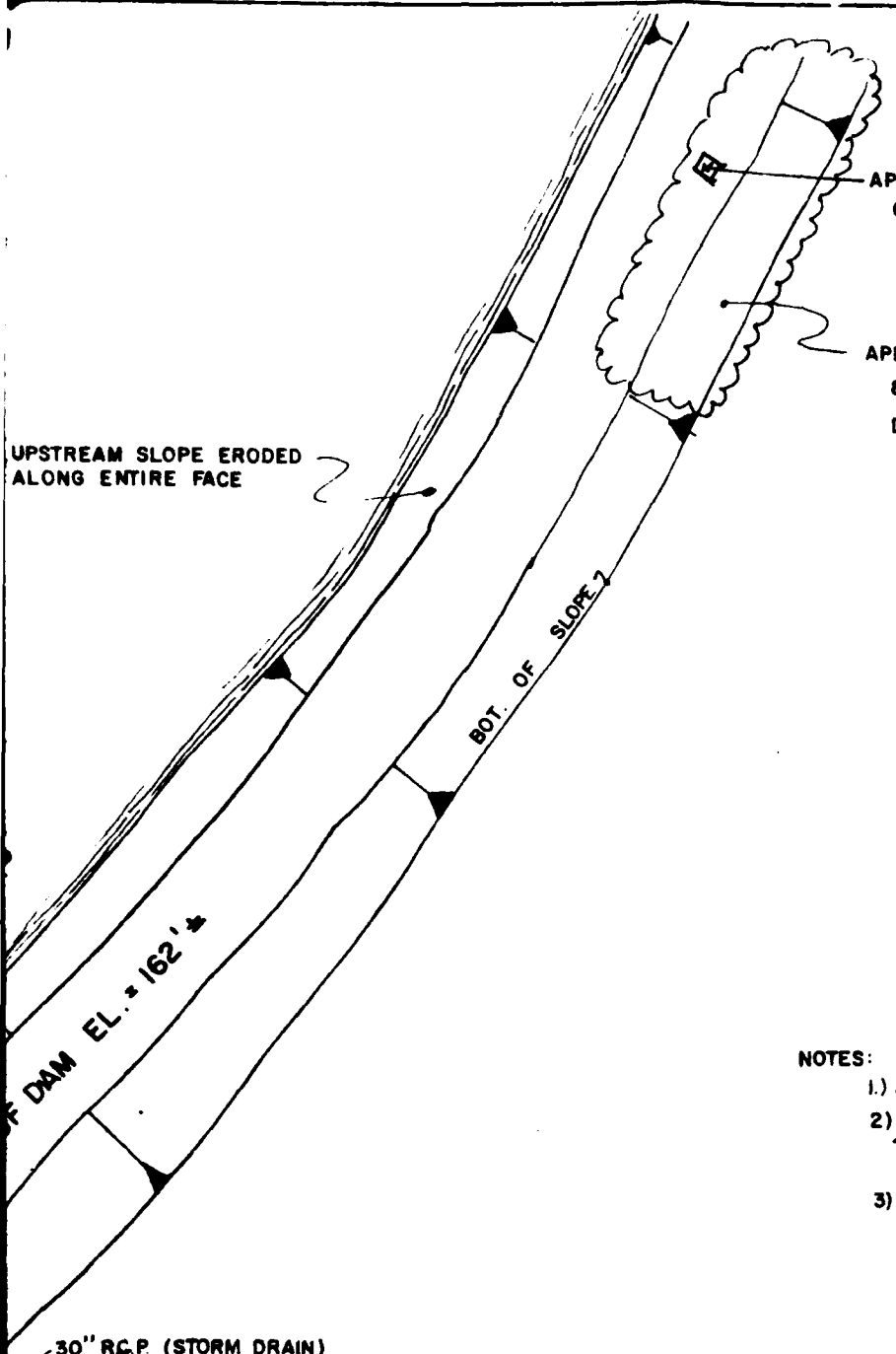
161.4

160.8

PLAN SC

0 40'

FIG. 2



NOTES:

1.) DATUM = NATIONAL GEODETIC VERTICAL DATUM

2) SLUICEWAY INFO A PLAN BY HOWARD M. TURNER DATED JUNE 1957

3) THIS PLAN IS A SKETCH PLAN ONLY

30" R.C.P. (STORM DRAIN)

15" R.C.P. (LOW LEVEL OUTLET)

PLAN SCALE

40' 80' 120'

ASEC CORPORATION *CONSULTING ENGINEERS* BOSTON, MASS.	U.S. ARMY ENGINEER DIV. NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

ARLINGTON RESERVOIR DAM

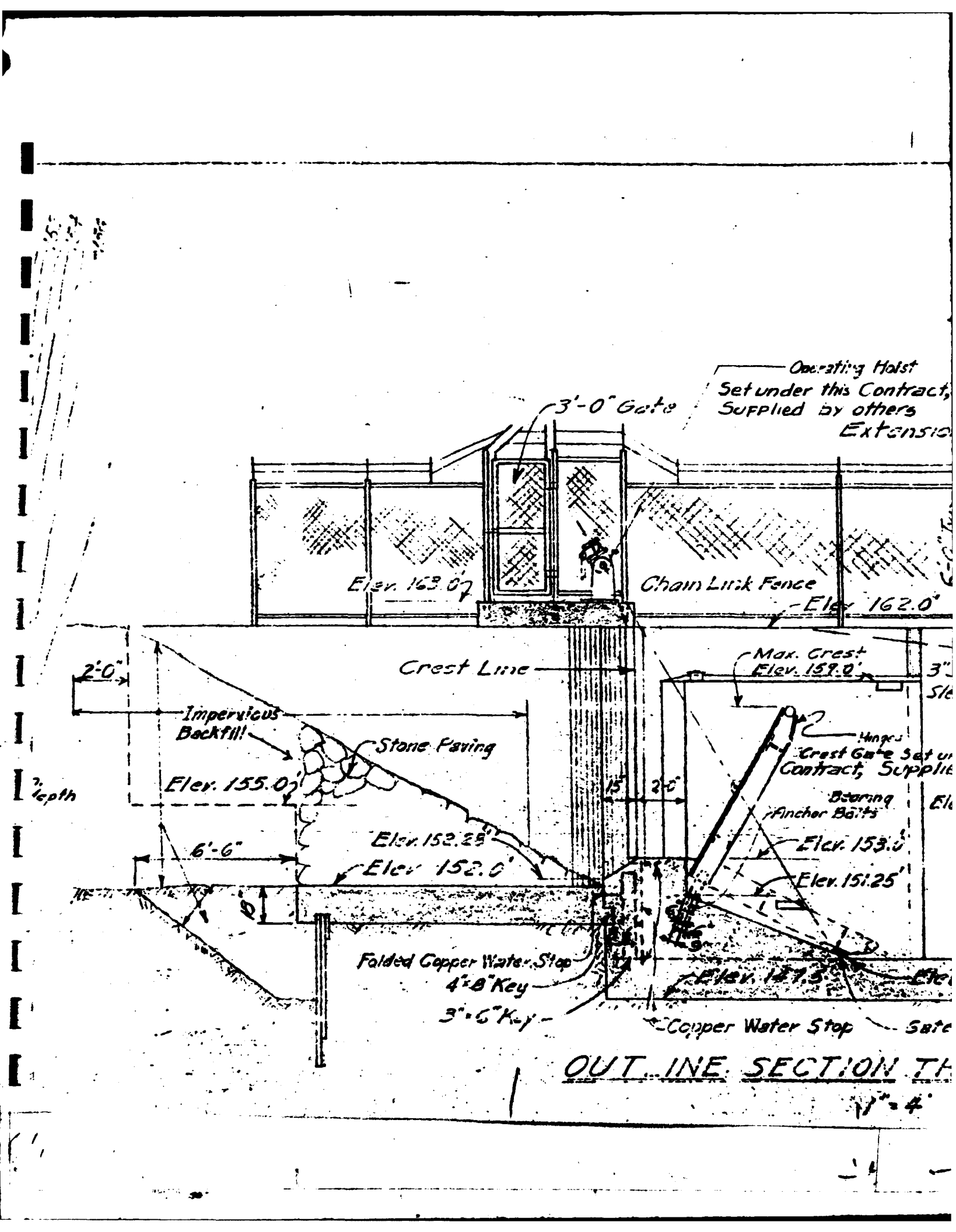
MASS. # 771

DRAWN	CHECKED	APPROVED	SCALE	DATE	PAGE
J.B.S.			1" = 40'	FEB. 4, 196	B-1

LIST OF REFERENCES

Reference 1 is located in the office of the town engineer at the Arlington Town Hall, 730 Massachusetts Avenue, Arlington, Massachusetts 02174.

1. "Sluiceway and Gate at Reservoir Dam Arlington Heights Reservoir Arlington, Mass." by Howard M. Turner Consulting Engineer, Boston, Mass. (2 sheets) June, 1957


Operating Hoist
Set under this Contract,
Supplied by others
Extensio
3'-0" Gate
Elev. 163.0'
Chain Link Fence
Elev. 162.0'
Crest Line
Max. Crest
Elev. 159.0'
2'-0"
Impervious
Backfill
Stone Paving
Elev. 155.0'
Depth
6'-6"
Elev. 152.25'
Elev. 152.0'
15"
2'-0"
Hinges
Crest Gate Set u
Contract, Supplie
Bearing
Anchor Bolts
Elev. 153.0'
Elev. 151.25'
Folded Copper Water Stop
4"x8" Key
3"x6" Key
Copper Water Stop
OUT...INE SECTION TH
1"=4'

DETAIL OF CREST GATE

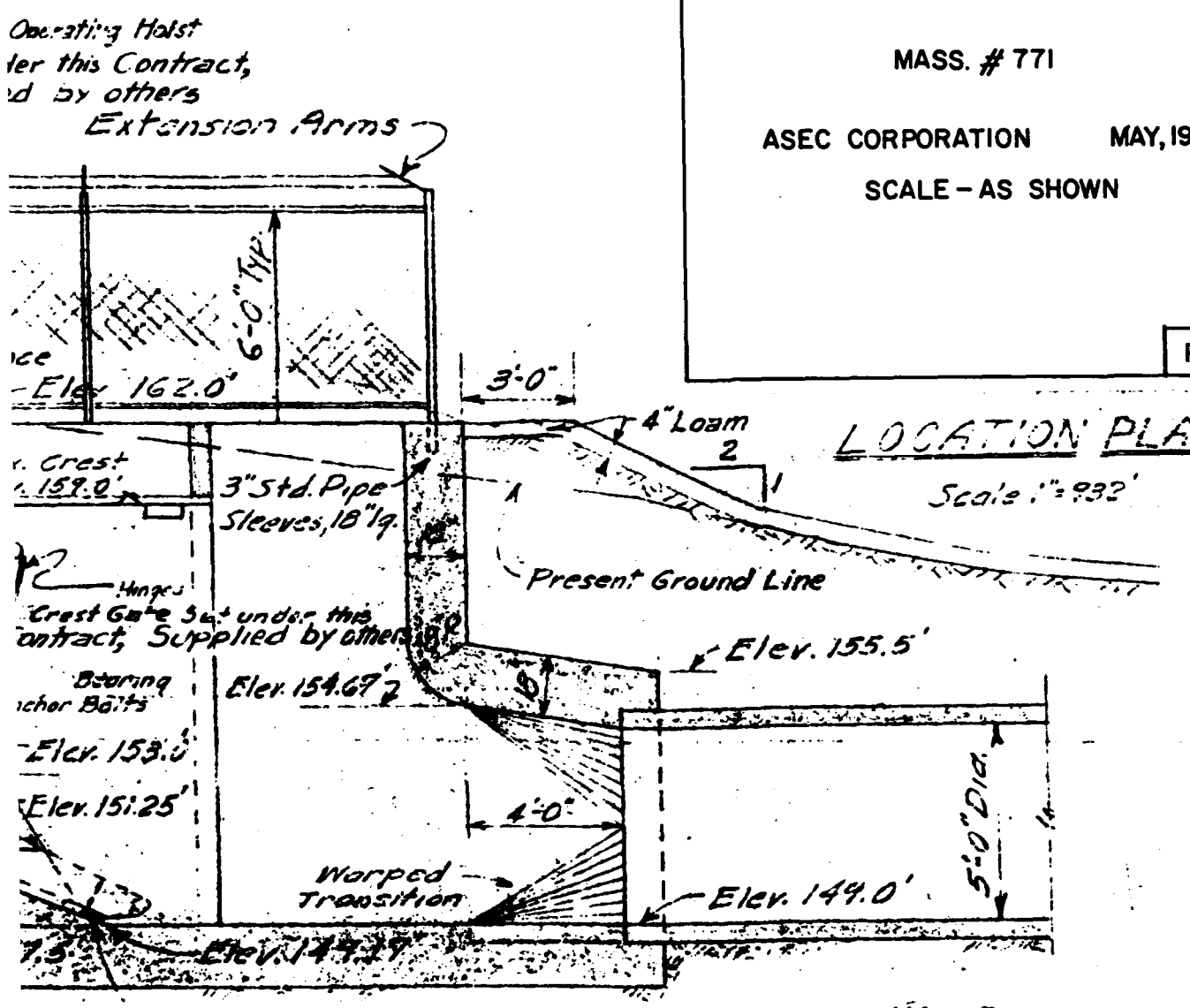
ARLINGTON RESERVOIR DAM

MASS. # 771

ASEC CORPORATION MAY, 1981

SCALE – AS SHOWN

PAGE B3



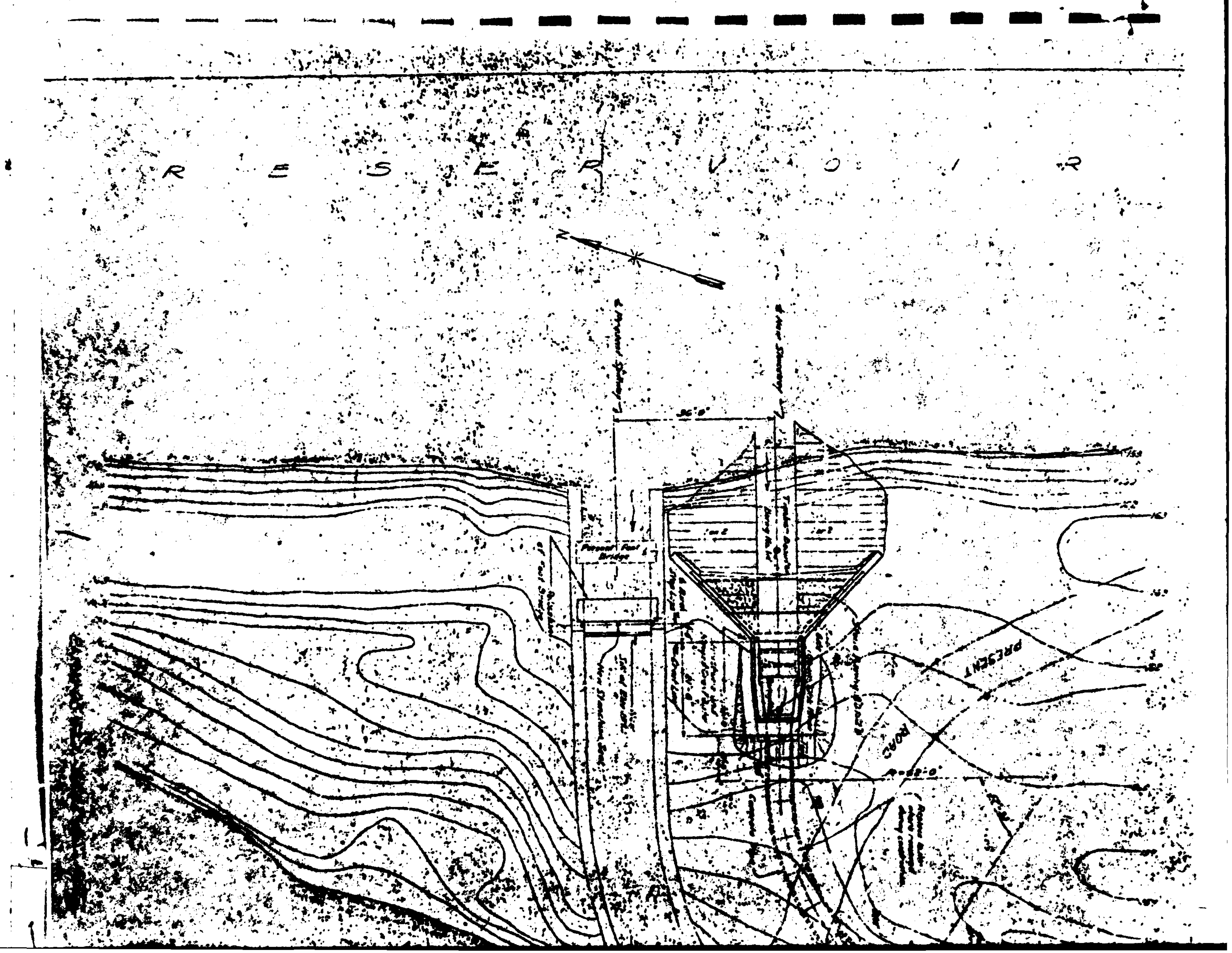
LOCATION PLAN

Scale 1" = 932'

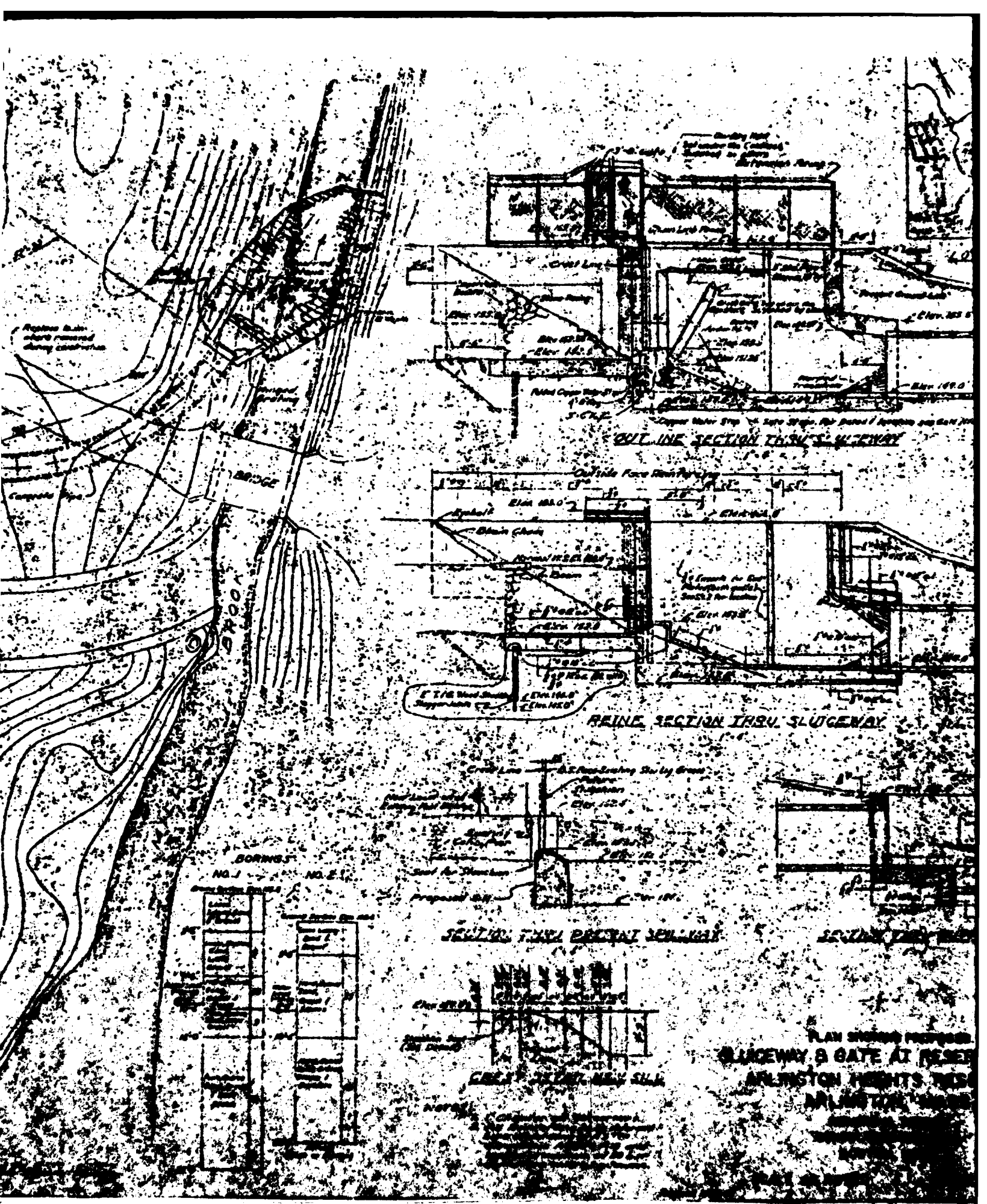
CTION THRU SLUICEWAY

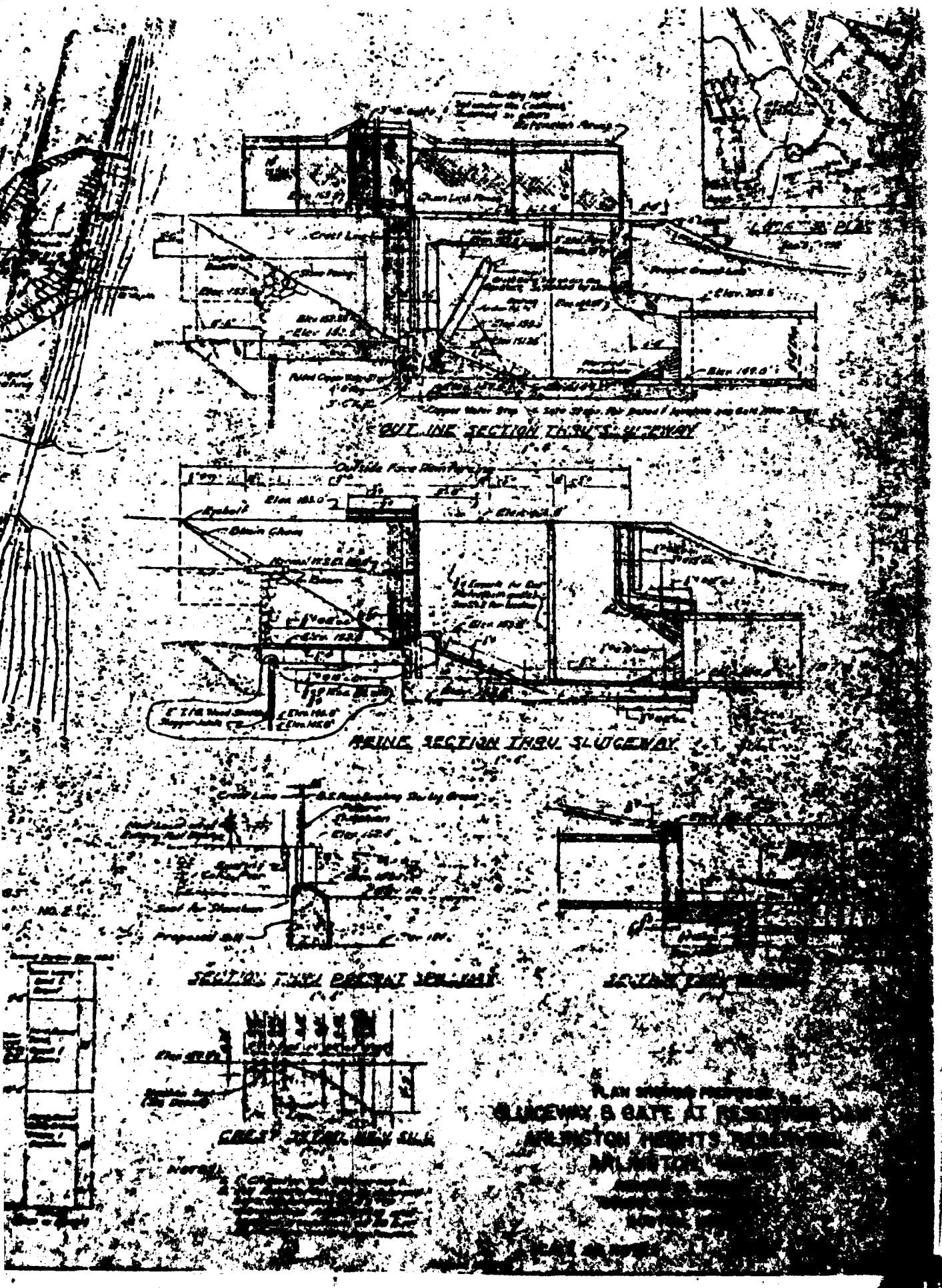
1" = 4'

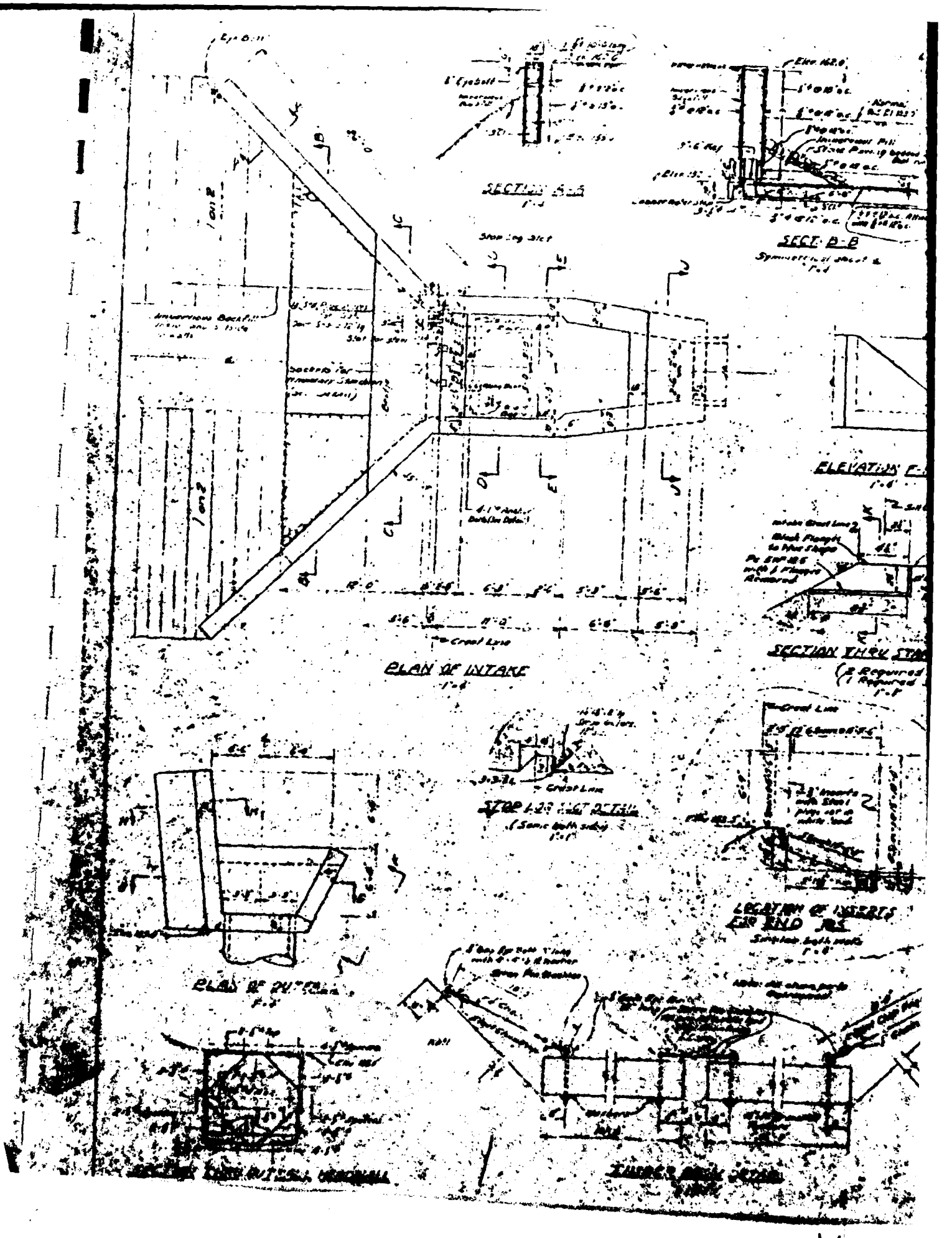
2

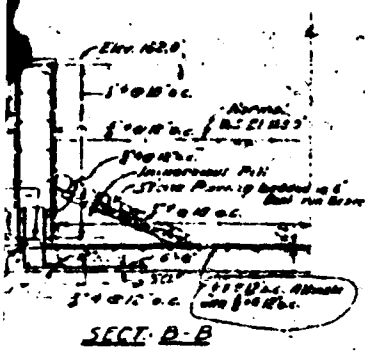


R E S E R V O I R
N
PRESENT
ROAD
Present Foot Bridge
New Stanchion Seat


BRIDGE
BORING #1
BORING #2
OUTLINE SECTION THRU SLUICEWAY
REINF. SECTION THRU SLUICEWAY
SECTION THRU RECTAL SCREEN
SECTION THRU
PLAN SHOWING PROPOSED
SLUICEWAY & GATE AT RESER
ARLINGTON HEIGHTS RES
ARLINGTON


OUTLINE SECTION THRU SLUICEWAY
MAIN SECTION THRU SLUICEWAY


SECTION A-A
SECT. B-B
PLAN OF INTAKE
ELEVATION
SECTION THRU STOP
LOCATION OF INVERTS
END RS



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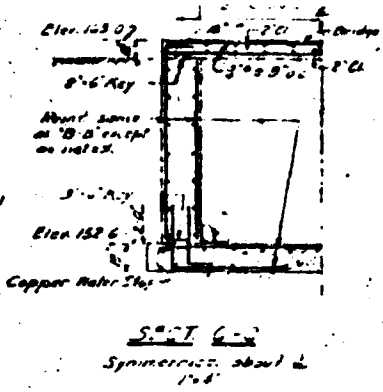
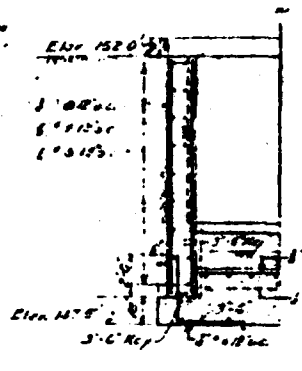


SECT C-C



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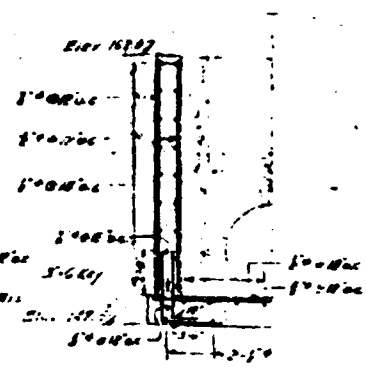

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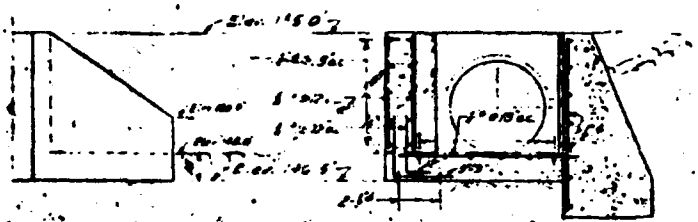
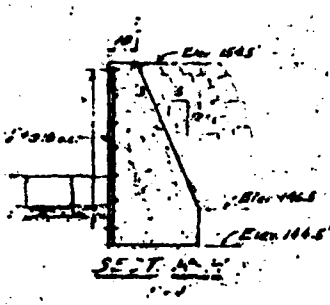


ELEVATION F-F

SECT G-G



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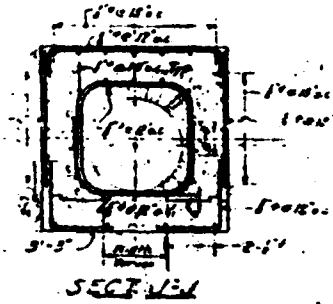
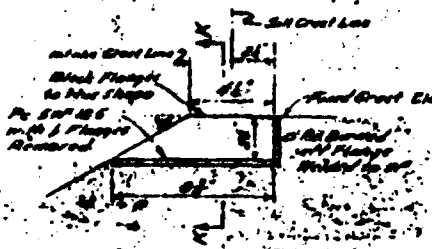
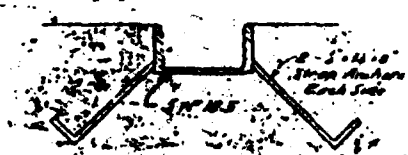


SECT I-I



SECTION THRU STANCHION SOCKET

(2 Required Inside)
(1 Required Sill)



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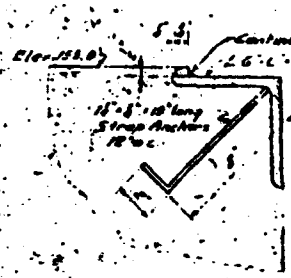
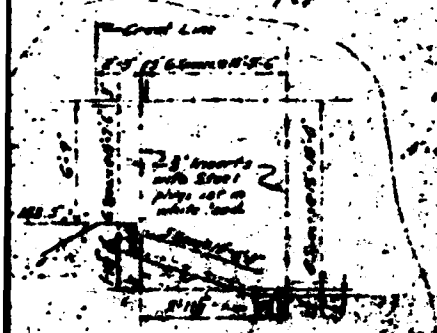
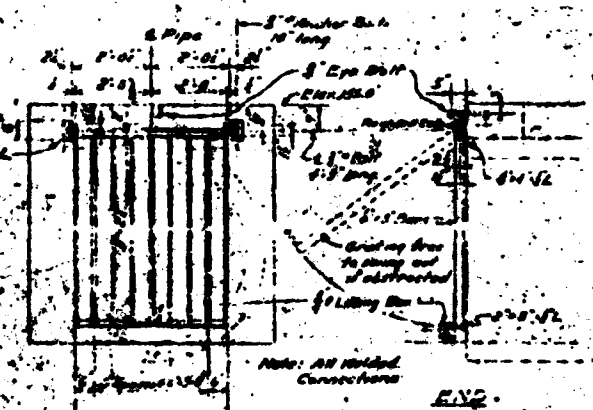


D.S. CREST ANGLE DETAIL



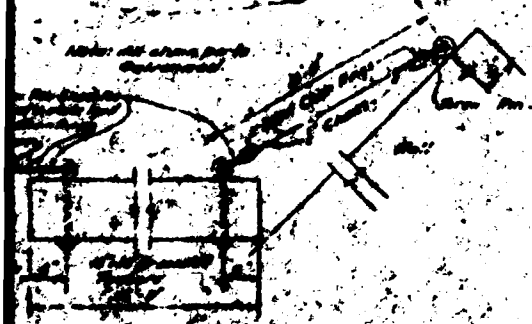
LOCATION OF INSERTS
FOR RAIL

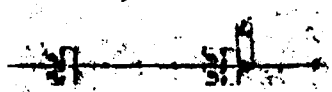


FRONT

END

GRATING AT OUTFALL



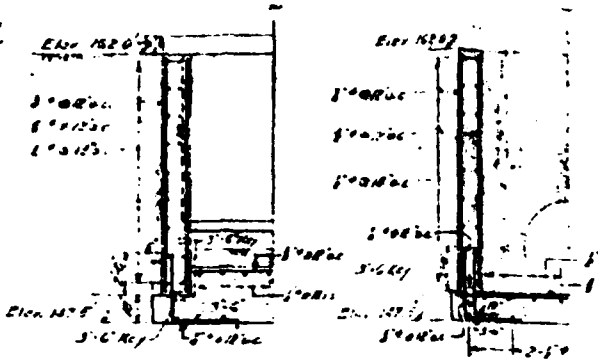


STRAIGHT BARREL

CURVED INLET STOP GATES

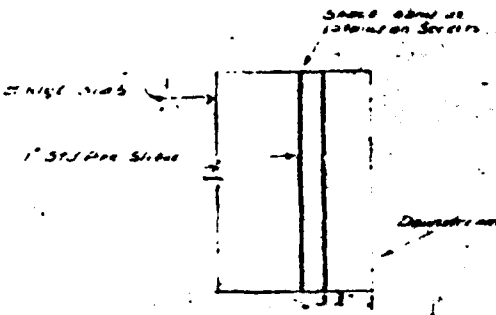
PLAN
SLUICEWAY B &
ARLINGTON
ARL

SCALE AS

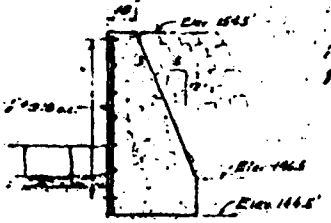


SECT K-K

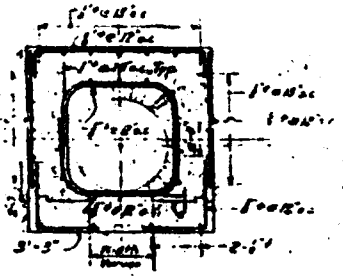
SECT E-E



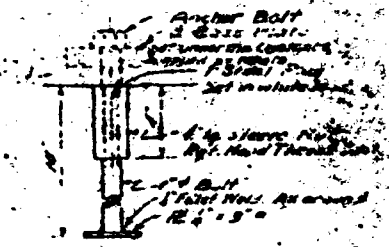
BRIDGE SLEEVE LOCATION



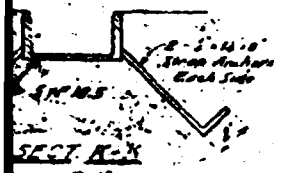
SECT A-A



SECT B-B



GATE BEARING ANCHOR BOLT DETAILS



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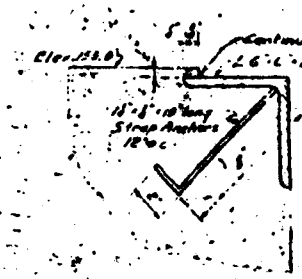
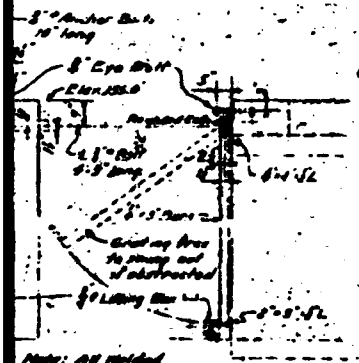


O.S. CREST ANGLE DETAIL



END

NG AT OUTFALL

STOP DETAIL

PLAN SHOWING DETAILS

SLUICEWAY & GATE AT RESERVOIR DAM

ARLINGTON HEIGHTS RESERVOIR

ARLINGTON, MASS.

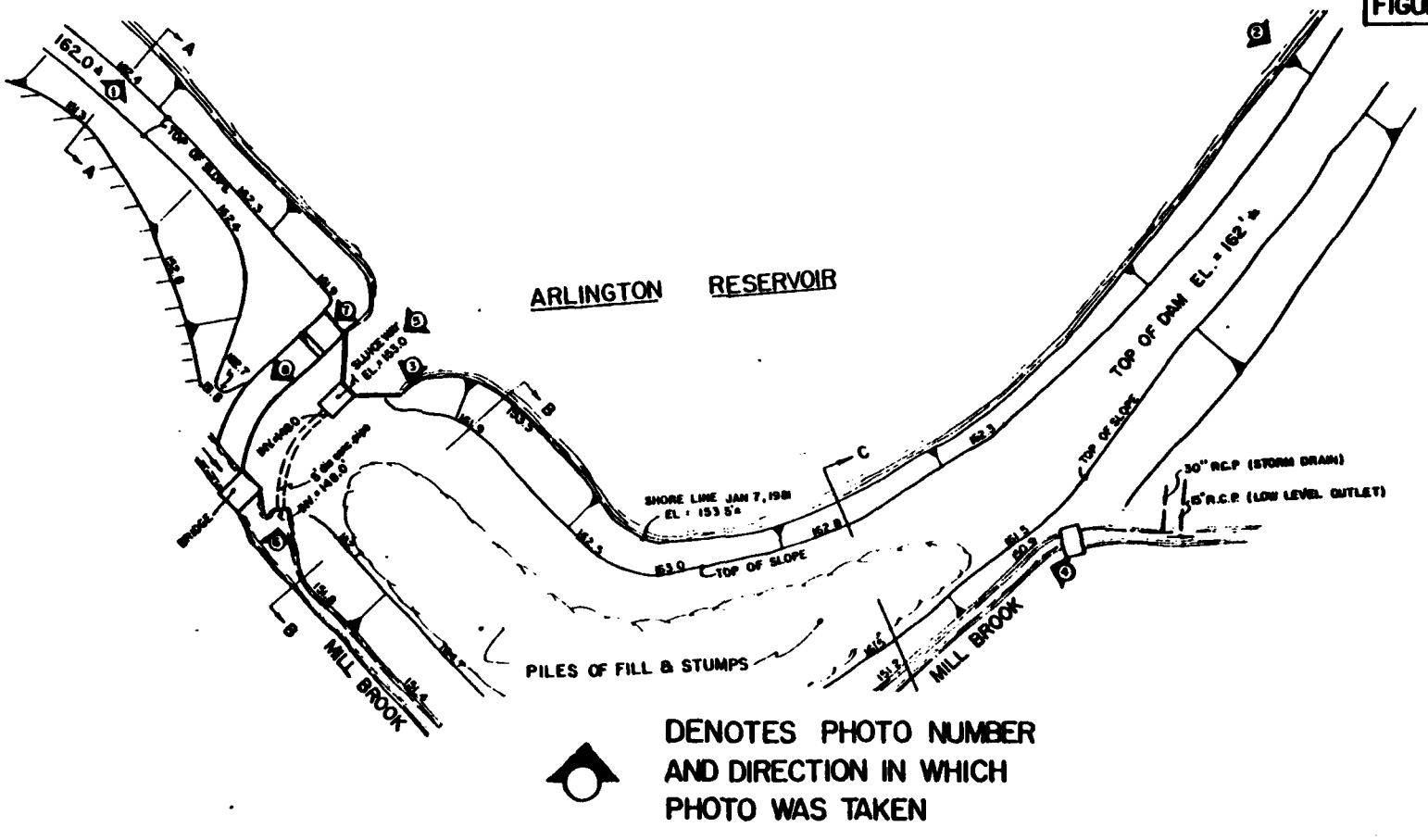
HOWARD M. TURNER
CONSULTING ENGINEER
BOSTON, MASS.

SCALE AS NOTED JUNE 1927

APPENDIX C

PHOTOGRAPHS

FIGURE



ASEC CORPORATION *CONSULTING ENGINEERS* BOSTON, MASS. FEBRUARY 1981	PHOTO LOCATION PLAN ARLINGTON RESERVOIR DAM MA 00771	U.S. ARMY ENGINEER DIV. NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS.

Photo # 1 Gully on Upstream Face (Rule extended 6 ft.)

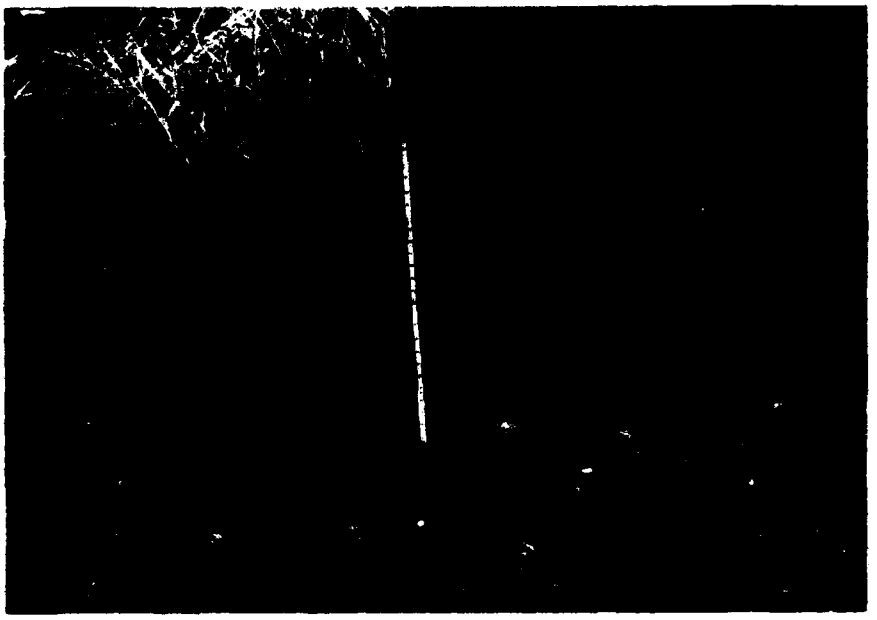


Photo # 2 Undercutting of Upstream Slope (Rule extended 2 ft.)

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM , MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	ARLINGTON RESERVOIR DAM TR. TO MILL BROOK ARLINGTON & LEXINGTON MASSACHUSETTS MA 00771 DECEMBER 8, 1980
ASEC CORP. CONSULTING ENGINEERS BOSTON , MASSACHUSETTS		

Photo # 3 Erosion adjacent to Left Wingwall (Rule extended 2 ft.)

Photo # 4 Erosion and Stream at Downstream Slope

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM , MASSACHUSETTS ASEC CORP. CONSULTING ENGINEERS BOSTON , MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	ARLINGTON RESERVOIR DAM TR. TO MILL BROOK ARLINGTON & LEXINGTON MASSACHUSETTS MA 00771 DECEMBER 8, 1980

Photo # 5 Sluiceway Intake Structure - Upstream Face

Photo # 6 Outlet Structure for Sluiceway - Downstream Face

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS ASEC CORP. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	ARLINGTON RESERVOIR DAM TR. TO MILL BROOK ARLINGTON & LEXINGTON MASSACHUSETTS MA 00771 DECEMBER 8, 1980

Photo # 7 Bridge over Emergency Spillway and Approach Channel

Photo # 8 Emergency Spillway Discharge Channel

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

ARLINGTON RESERVOIR DAM

ARLINGTON, MA

Dam Rating Curve

A schematic sketch of the dam is shown in Figure 1. This sketch is based on field survey and plans titled Sluiceway + Gate at Reservoir Dam, Arlington Heights Reservoir, Arlington, Mass. by Howard M. Turner, Boston, Mass. dated June, 1957. Additional information was also obtained on a recent field inspection of the site.

Elevation-discharge relations for the dam are shown on Graph 1. Discharges for the dam were developed using the standard weir-flow equations.

Spillway Discharge

$Q_1 = CLH^{1.5}$

C = 3.1 (sharp-crested weir)

L = 9.0'

H = head on spillway crest (datum elevation = 159.0' NGVD)

$Q_1 = 3.1 \times 9.0 \times H^{1.5}$

Emergency Spillway Discharge

$Q_2 = CLH^{1.5}$

C = 3.1 (sharp-crested weir)

L = 15.0'

H = head on spillway crest (datum elevation = 159.0' NGVD)

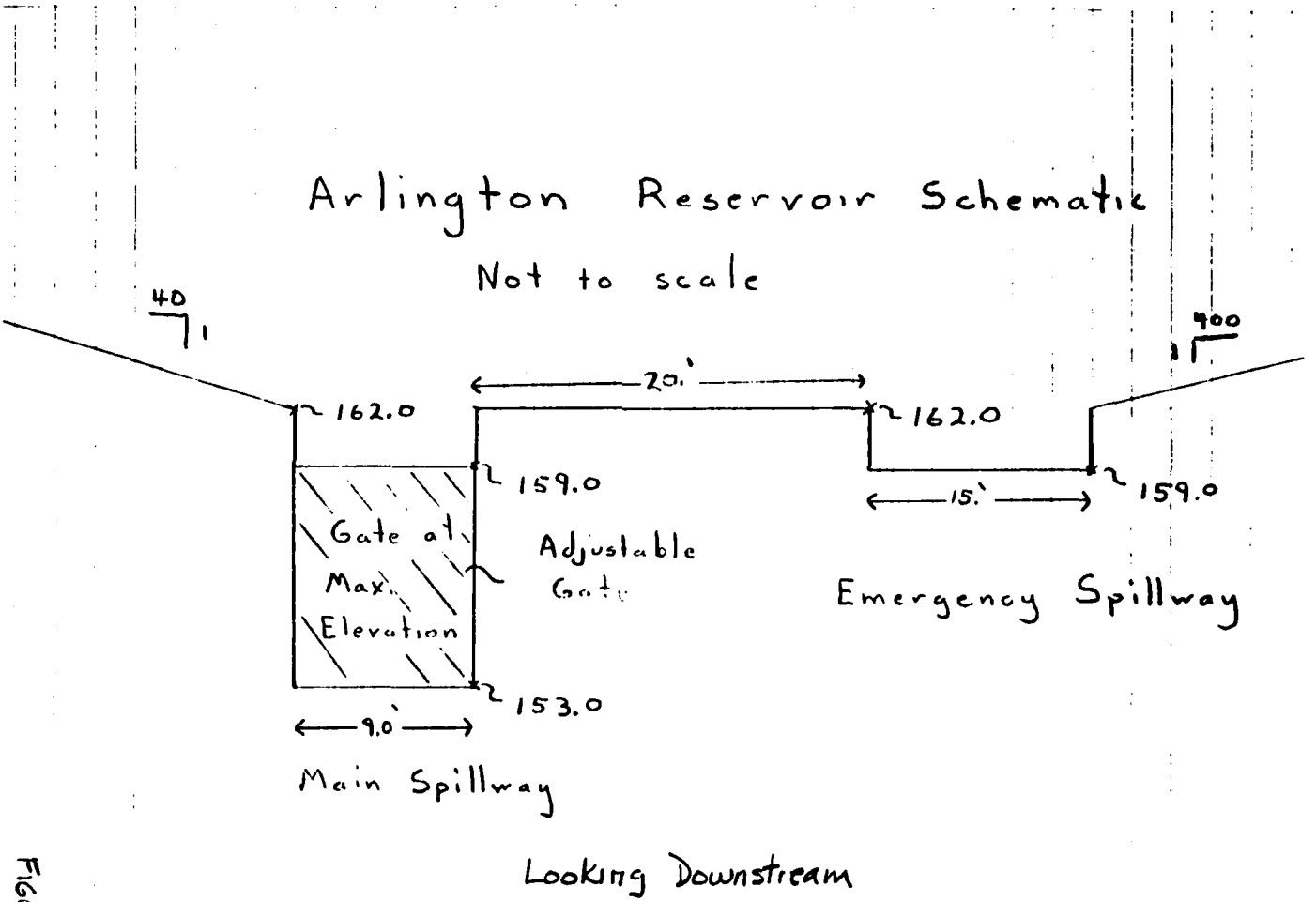

Arlington Reservoir Schematic
Not to scale
40
1
162.0
20'
162.0
159.0
Gate at Max. Elevation
Adjustable Gate
153.0
9.0'
Main Spillway
15'
159.0
Emergency Spillway
Looking Downstream

FIGURE 1

Dam Embankment Overflow Discharge

$Q_3 = CLH^{1.5}$

C = 2.6 (broad-crested weir)

L = 20.0'

H = head on dam crest (datum elevation = 162.0' NGVD)

$Q3 = 2.6 \times 20.0 \times H^{1.5}$

Left Dam Embankment Side-Slope Discharge

$Q_4 = CLH^{1.5}$

C = 2.6 (broad-crested weir)

L = 40 x h

H = 0.5 x h, h = head on dam crest (datum elevation = 162.0' NGVD)

$Q_4 = 2.6 \times (40 \times h) \times (0.5 \times h)^{1.5}$

Right Dam Embankment Side-Slope Discharge

$Q_5 = CLH^{1.5}$

C = 2.6 (broad-crested weir)

L = 400 x h

H = 0.5 x h, h = head on dam crest (datum elevation = 162.0' NGVD)

$Q_5 = 2.6 \times (400 \times h) \times (0.5 \times h)^{1.5}$

Total Dam Discharge

$Q_{Total} = Q_1 + Q_2 + Q_3 + Q_4 + Q_5$

DAM FAILURE ANALYSIS

Dam Failure With Maximum Pool

Assume that the dam fails with the pool at maximum level, which corresponds to the elevation of the top of the embankment (162.0, NGVD). The top of the embankment is 3.0 feet above the spillway crest at its maximum elevation (159.0 ' NGVD) and 14.0' above the downstream invert (below spillway).

Normal Outflow at Failure

The normal outflow from Arlington Reservoir at maximum pool is equal to 387 CFS. In order to account for the most severe conditions, the outflow from the Great Meadows watershed was also considered along with the Arlington Reservoir outflow. The Arlington Reservoir and the Great Meadows watershed join together at the toe of the dam. A 750 year event equal to 235 CFS was utilized as the outflow from the Great Meadows watershed.

The peak outflow from Great Meadows watershed was obtained from frequency-outflow curves developed from a C. E. Magure study on Mill Brook. The study used a HEC-1 hydrograph analysis which gives results adaptable for this Phase I inspection. The frequency-outflow curve for Great Meadows watershed is shown on Graph # 2.

Tailwater Level at Failure

The tailwater elevations for the dam failure analysis were calculated from elevation-discharge curves and elevation-cross

sectional area curves.

The elevation-discharge curves and elevation-cross sectional area curves were developed from the C. E. Maguire study which performed a HEC-2 backwater analysis in the study area. As Mill Brook consists of 25% underground conduit and 34% concrete or masonry channel this was considered the best hydraulic model suitable for a Phase 1 inspection (Graphs 4-9).

The following are locations of cross-sections used in the dam failure analysis:

Distance D/S of Dam	Normal Water Level (FT NGVD)
10	151.0
1240	148.6
2400	147.3
3720	115.1
4710	101.8
6870	73.2

Breach Outflow

Breach Outflow = Q_{p_1}

$Q_{p_1} = 8/27 \times W_b \times \sqrt{g} \times Y_o^{1.5}$

W_b = width of breach

$\leq$ o.4 x (width of dam at 1/2 height)

$\leq$ 0.4 x 265'

W_b = 106'

Y_o = pool elevation - downstream invert

14.0 = 162.0 - 148.0

$$Q_{P_1} = 8/27 \times 106 \times \sqrt{32.2} \times 14^{1.5}$$

$$Q_{P_1} = 9336 \text{ CFS}$$

Total Outflow

$$Q_{Total} = 387 + 235 + 9336 = 9958 \text{ CFS}$$

The table below gives pre-failure downstream stages resulting from entering each section's elevation-discharge curve at a discharge of 622 CFS (normal outflow at failure).

Section (FT D/S of dam)	Pre-Failure Stage (FT NGVD)
10	156.1
1240	154.9
2400	152.2
3720	118.5
4710	106.7
6870	77.1

Impounding Capacities of Reservoir

The surface area of Arlington Reservoir greatly increases with its rise in elevation. Therefore, lateral spreading must be considered for storage calculations.

Pool at top of dam (162.0 ft. NGVD)

Volume = 480 Acre-feet

Pool at spillway elevation (159.0 ft. NGVD)

Volume = 325 Acre-feet

Downstream Flooding

At 10' downstream of dam

Prior to failure

depth = 6.1' (Graph 4, with Q = 622 cfs)

After failure

depth = 8.8' (Graph 4, with Q = 9958 cfs)

Reach from 10' downstream to 1240' downstream of dam

To estimate peak dam break flow at a distance 1240' downstream of dam, we followed (essentially) the COE "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs."

Use stage-discharge and stage-cross-section area curves for sections 10' and 1240' downstream of dam (Graphs 4 and 5).

Storage Volume in Reach-Versus-Outflow

Assume channel and overbank storage of the flood wave is equal to the reach length times the average of the upstream post-failure flow area minus the upstream pre-failure flow area and the downstream post failure flow area minus the

downstream pre-failure flow area.

$$\text{Volume } (Ft^3) = \left[\frac{\left((A_{p_1} - A_{N_1}) + (A_{p_2} - A_{N_2}) \right)}{2} \right] X \; L$$

where: A_{p_1} = post-failure u/s cross-sectional flow area (Ft^2)

A_{N_1} = pre-failure u/s cross-sectional flow area (Ft^2)

A_{p_2} = pre-failure d/s cross-sectional flow area (Ft^2)

A_{N_2} = pre-failure d/s cross-sectional flow area (Ft^2)

L = reach length in feet

The attenuation of dam failure flow due to storage in the reach between 10' d/s and 1240' d/s:

$$Q_2 = 622 + Q_{p_1} \left(1 - \frac{V_1}{S} \right) = 622 + 9336 \left(1 - \frac{V_1}{480} \right)$$

where: V_1 = volume of storage in reach, above pre-failure stage (acre-feet)

S = storage in reservoir before failure (acre-feet)

Q_{p_1} = breach outflow at upstream end of reach

Q_2 = total outflow at downstream end of reach after dam failure

The attenuation of the peak dam failure flow at the downstream end of this reach is to a discharge of 9283 cfs at elevation 158.3' (Graph #5). Damage in this reach would be severe with 6 apartment buildings receiving flooding up to 4 feet in depth. Loss of life is probable.

The attenuation of next reach between 1240 ft. d/s and 2400 ft. d/s of the dam is shown on Graph #6. At the end of this reach the flood wave is attenuated to 8455 cfs at elevation 155.5'. Damage in this reach would be very severe with 8 apartment buildings and 41 commercial and residential structures receiving up to 5 feet of flooding. Three roads would also be overtopped. There is a great danger of loss of life in this reach.

Between 2400 ft. d/s and 3720 ft. d/s the failure discharge is attenuated to 7848 cfs with a corresponding elevation of 125.9 ft. (Graph #7). Damage in this reach would also be severe with 7 commercial structures and 2 residences experiencing flooding. Two roads would also be overtopped. There is a great danger of loss of life in this reach also.

Between 3720 ft. d/s and 4710 ft. d/s of the dam, the failure discharge is attenuated to 7351 cfs with a corresponding elevation of 114' (Graph #8). Damage in this reach would be severe with 6 commercial structures and 36 residential structures receiving flooding. Three roads would also be inundated in this reach. There is a great danger of loss of life.

Between 4710 ft. d/s and 6870 ft. d/s of the dam, the failure discharge is attenuated to 6610 cfs at elevation 81.8 (Graph #9). Damage in this reach would consist of flooding to 12 commercial structures, 14 residential structures, 3 apartment buildings and 5 roads. Again, there is a significant danger of loss of life in this reach.

The study was concluded at 6870 ft. or 1.3 miles downstream of the dam as extensive damage could be expected to occur if Arlington Reservoir fails at maximum pool.

Estimates of damage down to 1.3 miles below the reservoir totaled 17 apartment buildings, 74 residential structures, 46 commercial structures and 13 roads flooded. The final end to the flood wave appears to be the Lower Mystic Lake, which lies 2.8 miles d/s of Arlington Reservoir. Thus the flood wave will be attenuating for another 1.5 miles before reaching Lower Mystic Lake causing further amounts of damage.

Test Flood Analysis

Size Classification: Small (storage between 50 and 1000 acre-feet: height < 40').

Hazard Classification: High (downstream area highly urbanized)

According to COE "Recommended Guidelines" the hazard and Size classifications of the dam indicate a test flood between 1/2 PMF to PMF.

Since the size of the reservoir is low to average in the small size classification, a ½ PMF is used for the test flood.

The ½ PMF is estimated using the COE "Preliminary Guidance For Estimating, Maximum Probable Discharges in Phase I Dam Safety Investigations" dated March 1978. Since the study area is in the eastern Massachusetts region, the flat curve of the Maximum Probable Flood Peak Flow Rate graph is used. This gives a PMF of 900 CFS/sq. mile for the 2.36 sq. mile drainage area or a PMF of 2124 CFS. The ½ PMF is computed as follows:

$$\tfrac{1}{2}\ (2124) = 1062 \text{ CFS}$$

Stage Storage Curve

The storage with the reservoir gate at its maximum elevation (159.0 ft. NGVD) is approximately 325 acre-feet. The pond surface area at 159.0' NGVD is approximately 39 acres. Pond surface areas at 160.0' and 170.0' NGVD were measured from the Lexington USGS quadrangle map. At 160.0' NGVD, the pond surface

area is approximately 47 acres and at 170.0' NGVD, the pond surface area is approximately 140 acres. The storage is computed as follows:

Surcharge Storage (to 162.0' NGVD - top of dam)

159.0' - 160.0' NGVD: $\frac{39 + 47}{2} = 43 \times 1' = 43$ acre-feet

160.0' - 162.0' NGVD: @ 162.0' $\frac{140 - 47}{10} = 9$ acres/ft.

$9 \times 2' = 18 + 47 = 65$ acres

$\frac{47 + 65}{2} = 56 \times 2 = 112$ acre-feet

$43 + 112 = 155$ acre-feet

Total Storage = $325 + 155 = 480$ acre-feet

The stage-storage curve is given on Graph #10.

For the drainage area of 2.36 square miles or 1510 acres:

1" of runoff = $\frac{1510\ (1")}{12"/\text{foot}} = 126$ acre-feet

1 acre-foot = 1/126 = 0.0079" of runoff

Surcharge Storage to the top of dam =

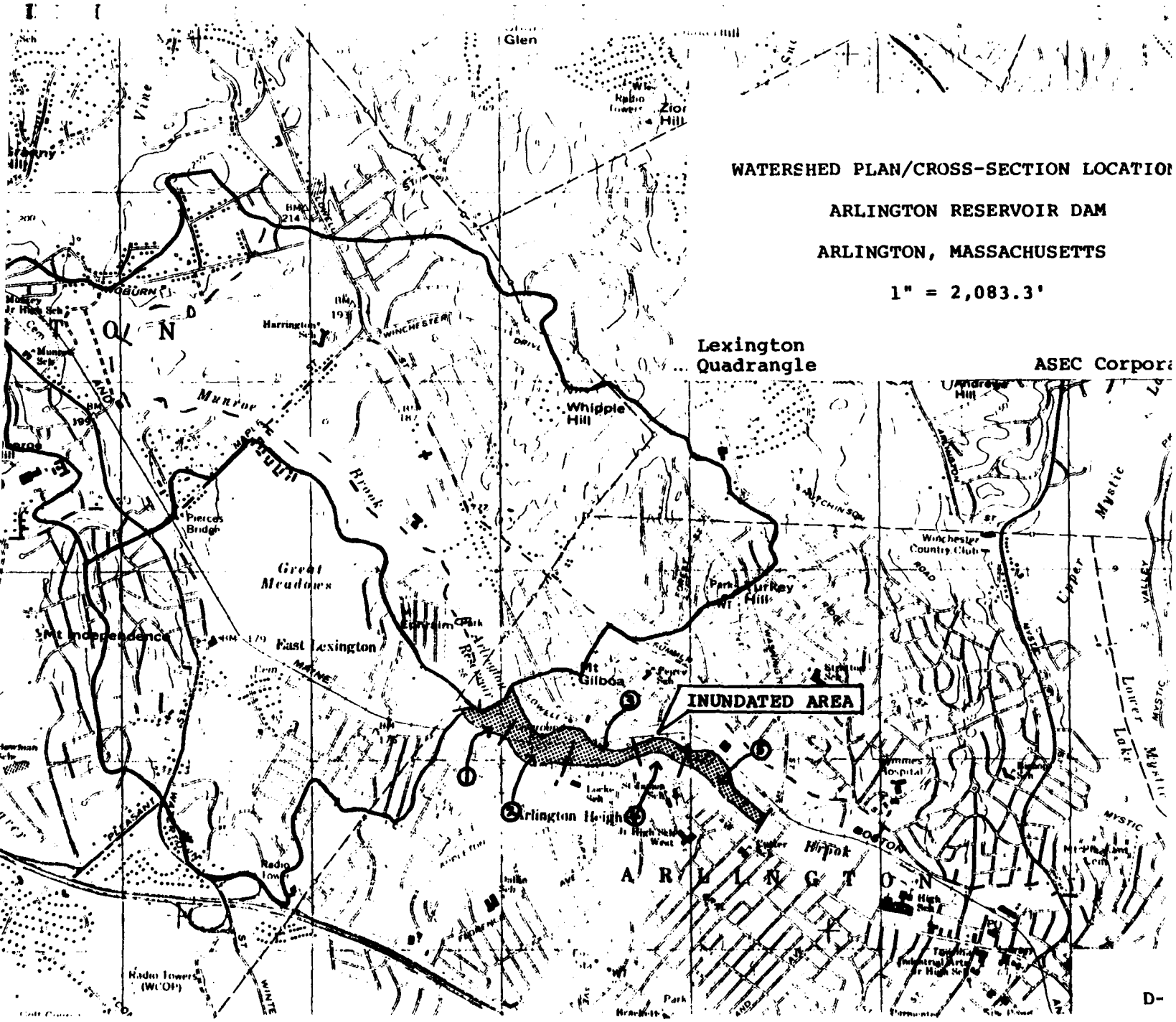
155 acre-feet = 1.23" of runoff

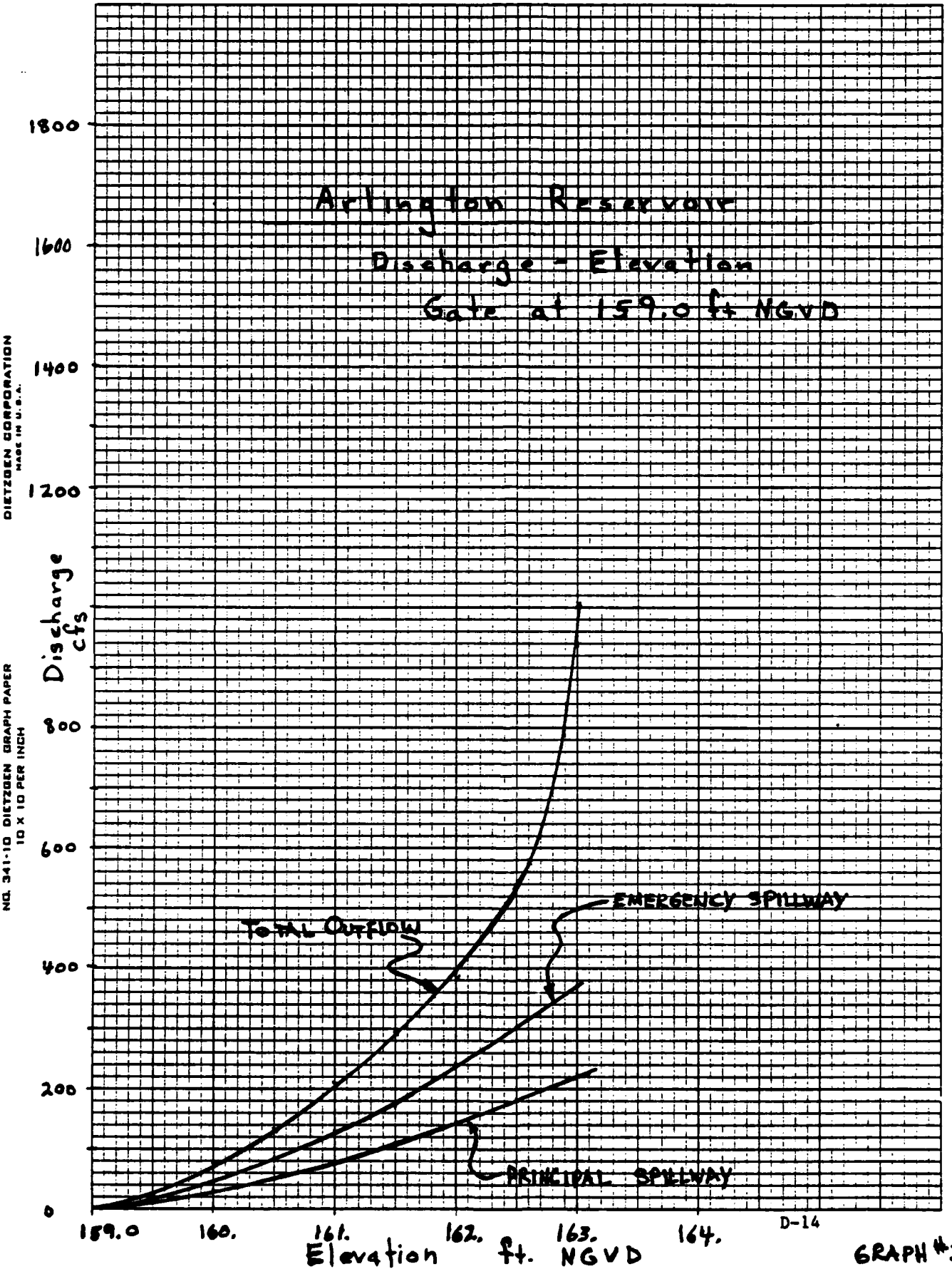
The attenuation of the test flood inflow due to surcharge storage in the pond is calculated on Graph #3.

The peak test flood outflow is 861 CFS, with a corresponding stage of 162.9' NGVD. which is 0.9' above the top of the dam. The spillways cannot handle a flood of magnitude of ½ PMF with the reservoir gate at its maximum elevation (159.0' NGVD). However, it is probable that a flood of magnitude of ½ PMF could be passed if the reservoir gate were set at a lower elevation. The C.E. Maguire hydrologic and hydraulic analysis of Mill Brook for the Corps of Engineers dated 1978 provides detailed analysis for two large magnitude storms. The Standard Project Flood and the August 1955 storm of record are both apparently passed without overtopping of the dam as the maximum outflow for both is about 170 CFS.

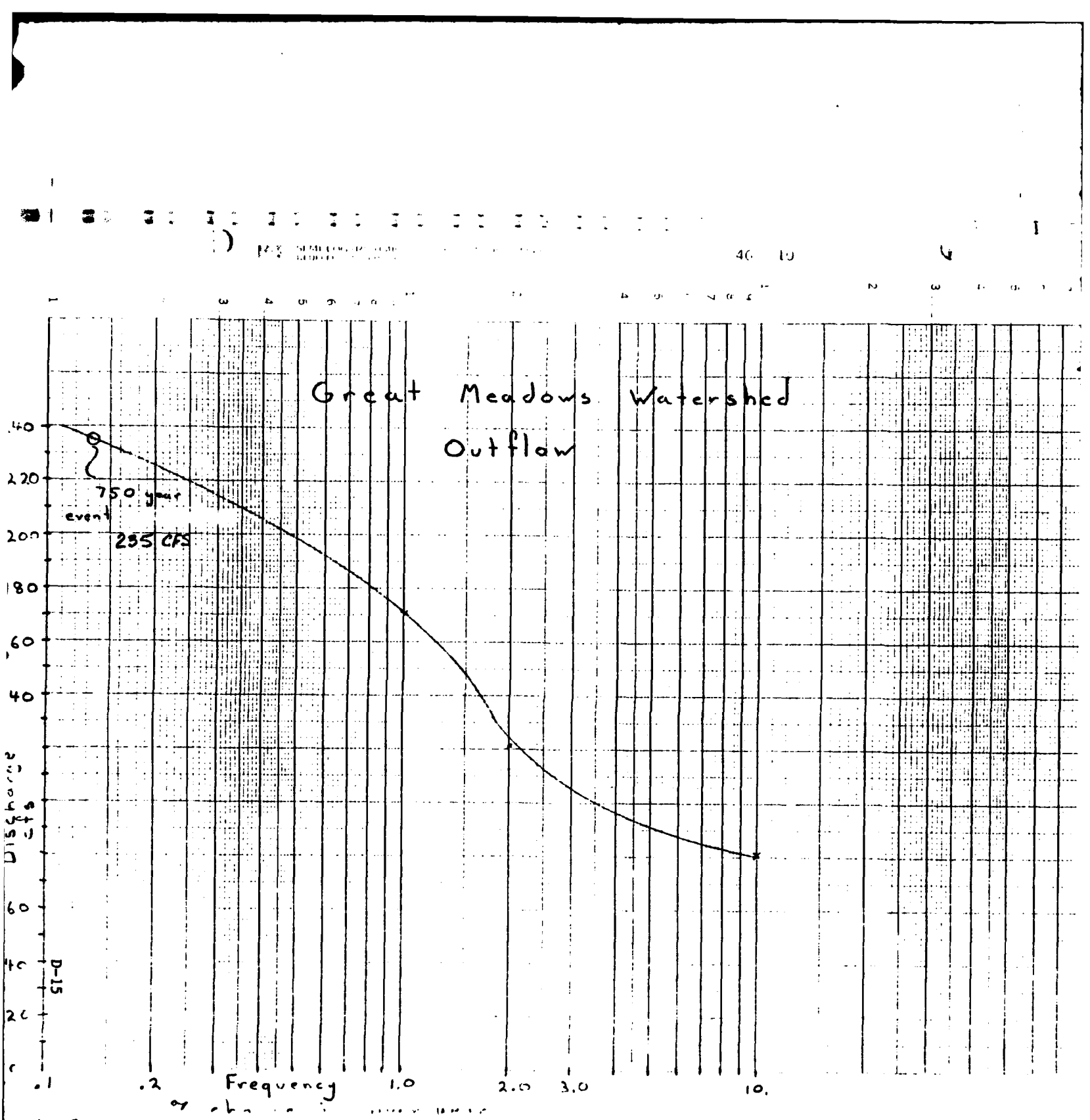
The table below summarizes the downstream effects of failure of Arlington Reservoir Dam

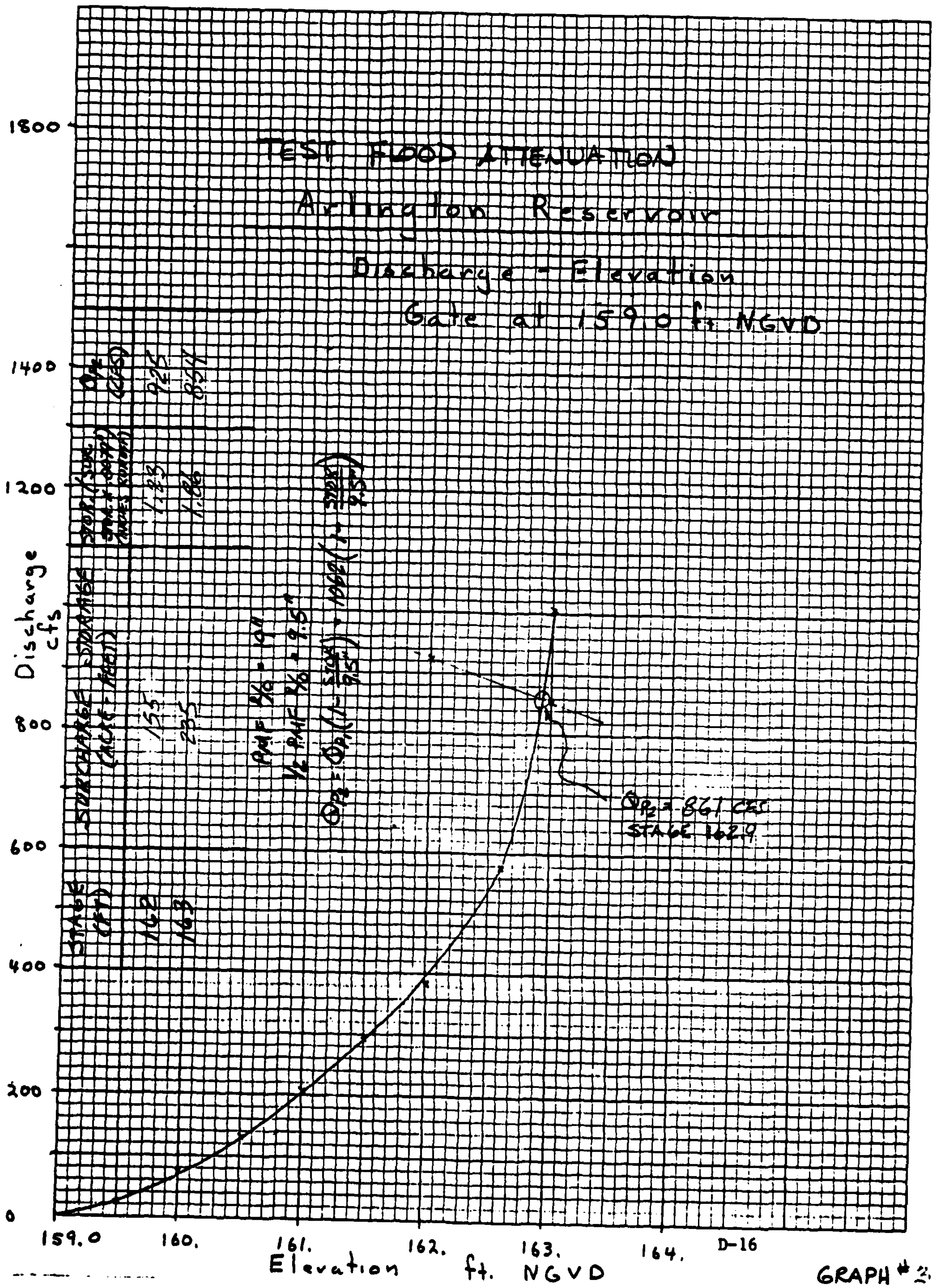
Location No. (See Map)	Distance D/S of Dam (ft.)	Number of Structures	Level Above Stream (ft.)	Flow (cfs) Stage (ft. above stream) Before Failure	Flow (cfs) Stage (ft. above stream) After Failure	Comment
1	10-1240	6 Apartment buildings	5	622/6.3	9283/9.9	Significar danger to
2	1240-2400	8 Apartment buildings 41 Commercial/ Residential 3 Roadways	3 - 8	622/4.9	8455/8.2	Great danc to life
3	2400-3720	7 Commercial Structures 2 Residences 2 Roadways	2 - 10	622/3.4	7848/10.65	Great danc to life
4	3720-4710	6 Commercial Structures 36 Residences 3 Roadways	6 - 12	622/4.9	7351/12	Great danc to life
5	4710-6870	12 Commercial Structures 14 Residences 3 Apartment buildings 5 Roadways	6 - 8	622/3.9	6610/8.4	Great danc to life


WATERSHED PLAN/CROSS-SECTION LOCATION
ARLINGTON RESERVOIR DAM
ARLINGTON, MASSACHUSETTS
1" = 2,083.3'
Lexington
Quadrangle
ASEC Corpora
INUNDATED AREA
Whipple Hill
Great Meadows
Mt Independence
East Lexington
Mt Gilboa
Arlington Heights
Turkey Hill
Pierces Bridge
Munroe Brook
Vine
Glen
Upper Mystic
Lower Lake
Winchester Country Club
Radio Tower (WCOP)
A R L I N G T O N
D-


Arlington Reservoir
Discharge - Elevation
Gate at 159.0 ft NGVD
Discharge cfs
1800
1600
1400
1200
800
600
400
200
0
TOTAL OUTFLOW
EMERGENCY SPILLWAY
PRINCIPAL SPILLWAY
159.0
160.
161.
162.
163.
164.
Elevation ft. NGVD
DIETZGEN CORPORATION MADE IN U.S.A.
NO. 341-10 DIETZGEN GRAPH PAPER 10 X 10 PER INCH

GRAPH #1

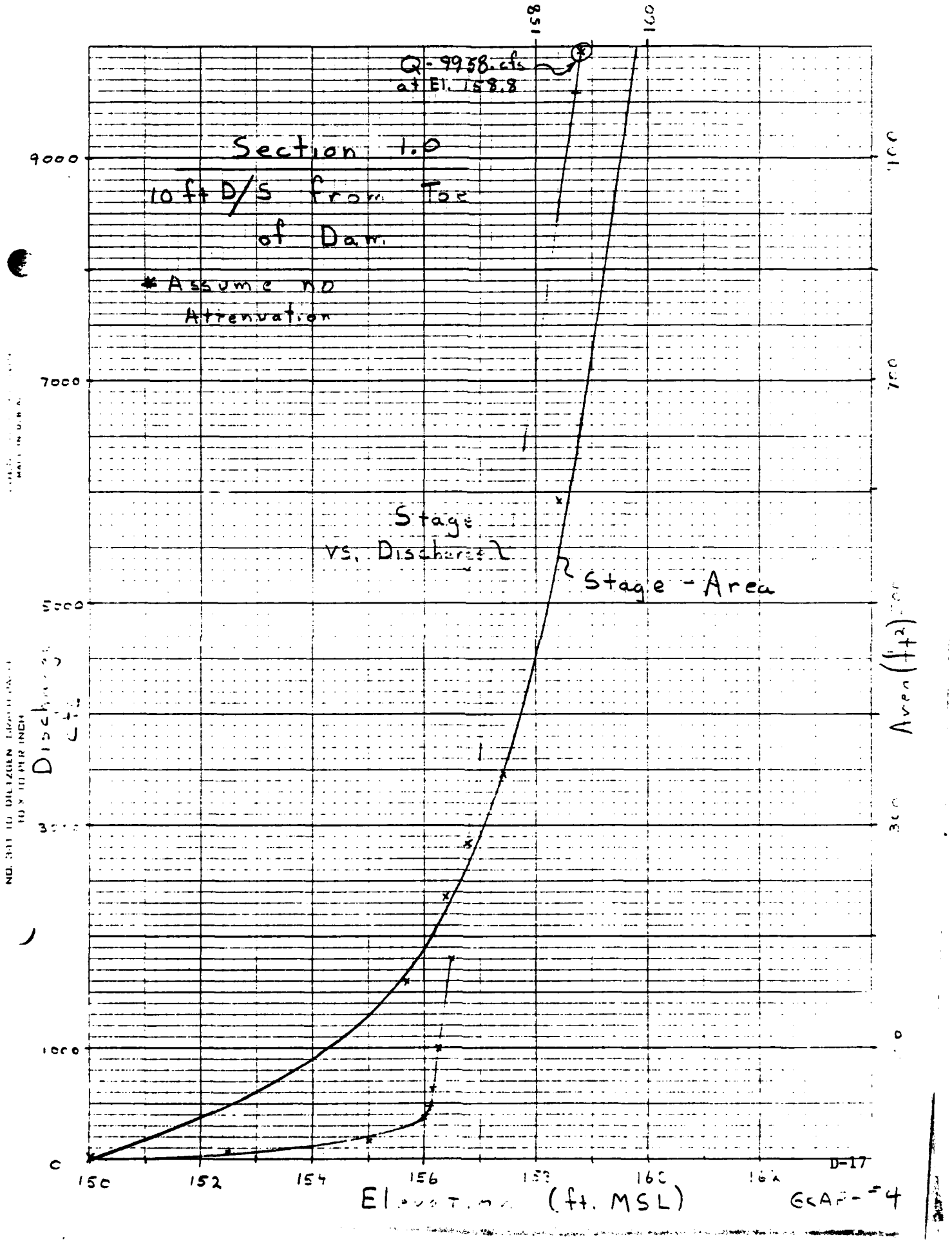

Great Meadows Watershed
Outflow
750 year
event
255 CFS
Discharge cfs
Frequency
.1
.2
1.0
2.0
3.0
10.
D-15

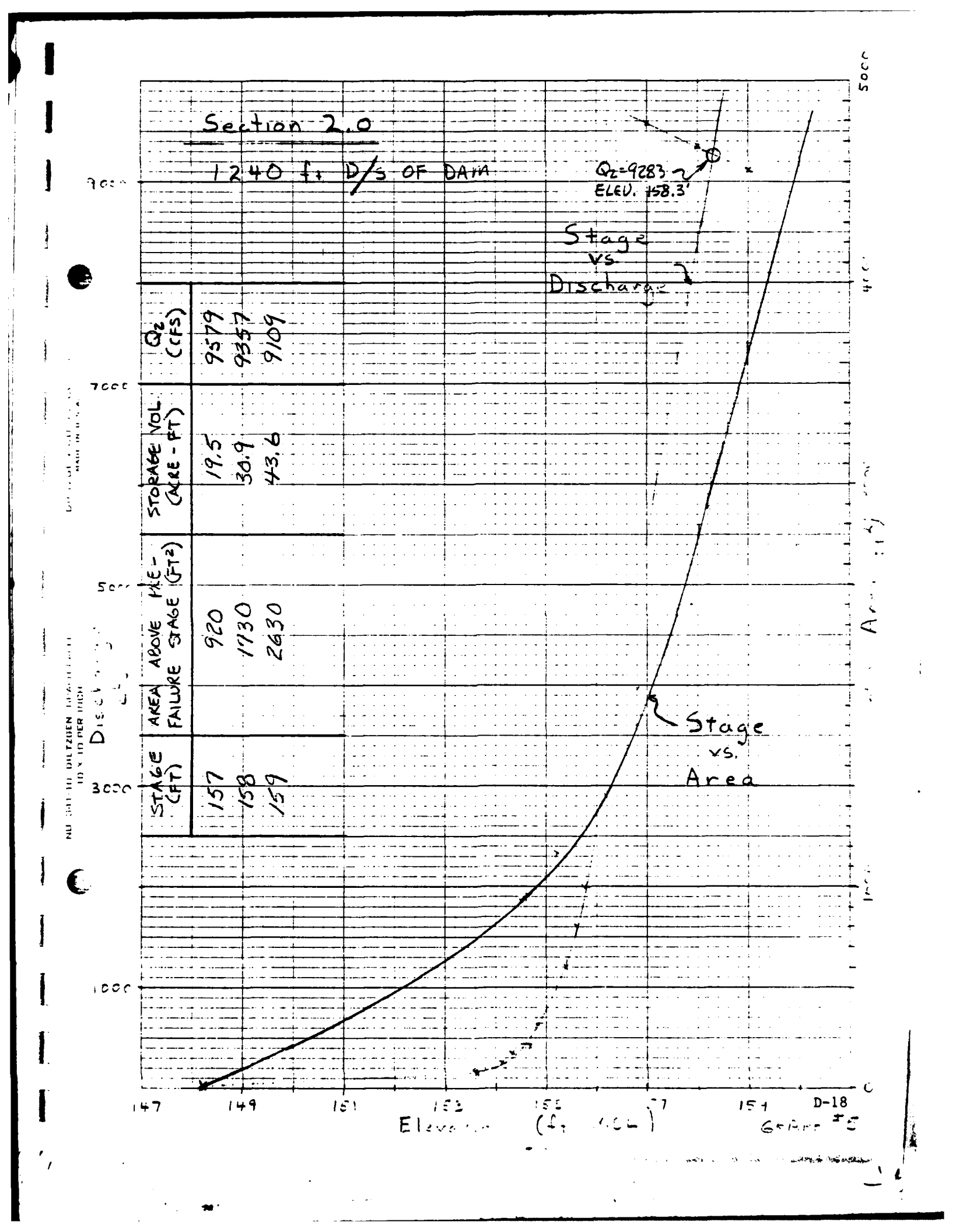


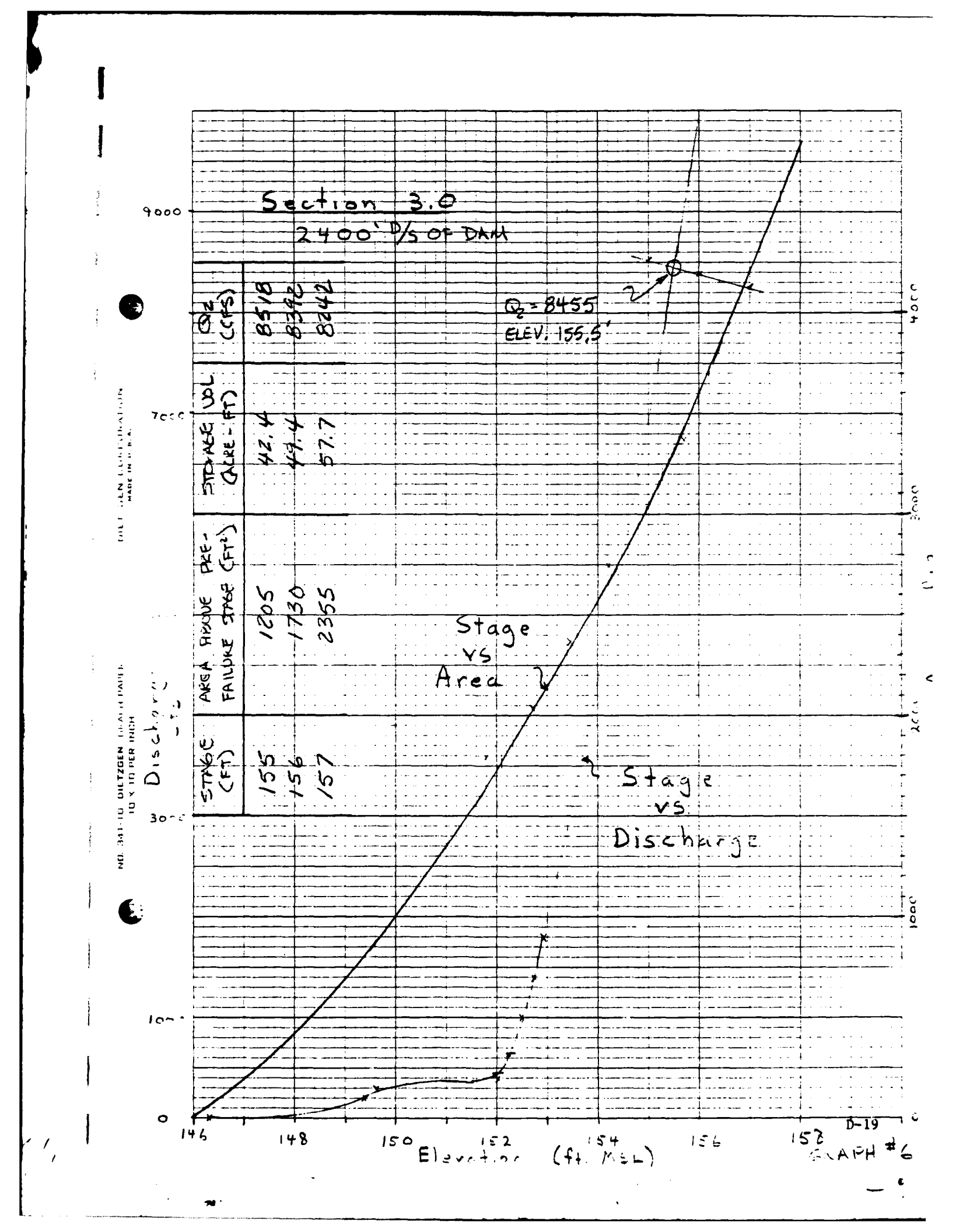
TEST FLOOD ATTENUATION
Arlington Reservoir
Discharge - Elevation
Gate at 159.0 ft. NGVD
Discharge cfs
1800
1400
1200
800
600
400
200
0
159.0
160.
161.
162.
163.
164.
Elevation ft. NGVD
STAGE (FT)
SURCHARGE STORAGE (ACRE-FEET)
162
163
155
235
1.23
1.86
PMF R/O = 19"
1/2 PMF R/O = 9.5"
STAGE 162.9

D-16

GRAPH #2

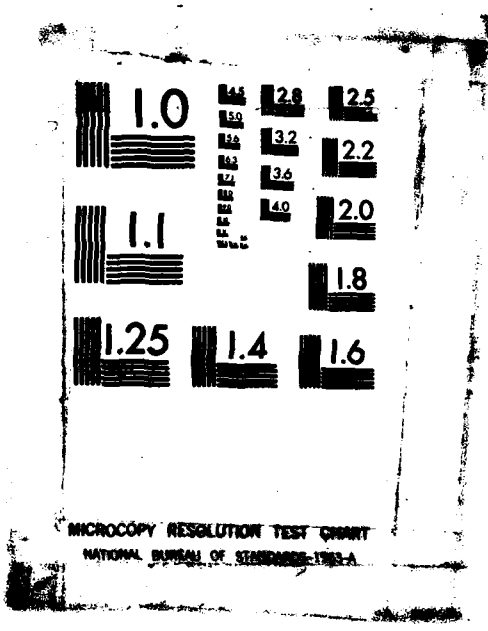

Q = 9958 cfs
at El. 158.8
Section 1.0
10 ft D/S from Toe
of Dam
* Assume no
Attenuation
Stage
vs. Discharge
Stage - Area
9000
7000
5000
1000
0
158
160
150
152
154
156
158
160
162
Elevation (ft. MSL)
Area (ft²)
D-17
GCAP-54

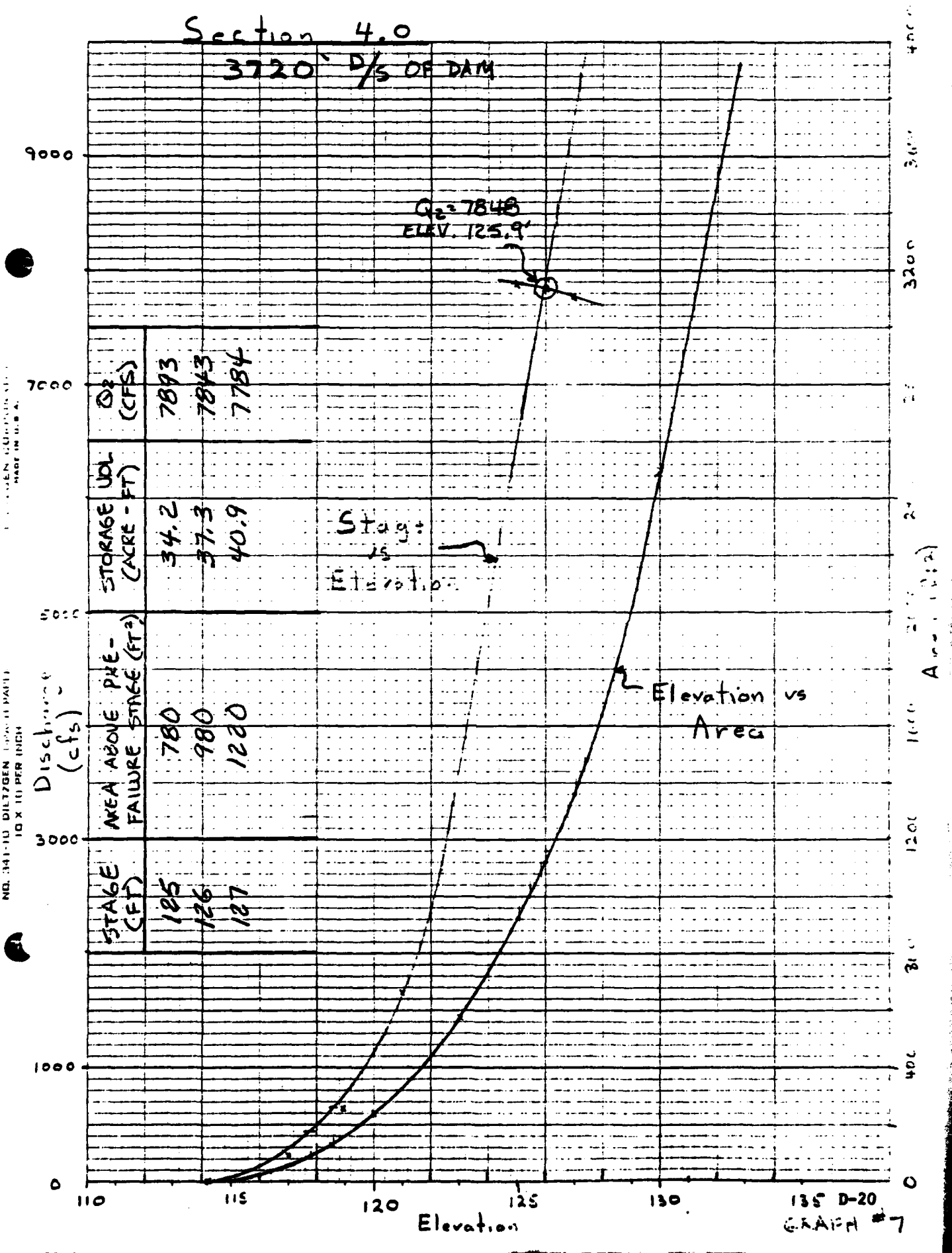

Section 2.0
1240 ft D/S OF DAM
Q_2=9283
ELEV. 158.3'
Stage vs Discharge
Stage vs. Area
Q_2 (CFS)
9579
9357
9109
STORAGE VOL (ACRE-FT)
19.5
30.9
43.6
AREA ABOVE HE-FAILURE STAGE (FT^2)
920
1730
2630
STAGE (FT)
157
158
159
147
149
151
153
155
157
159
Elevation (ft MSL)
Discharge
Area
7000
5000
3000
1000
5000
4000
D-18

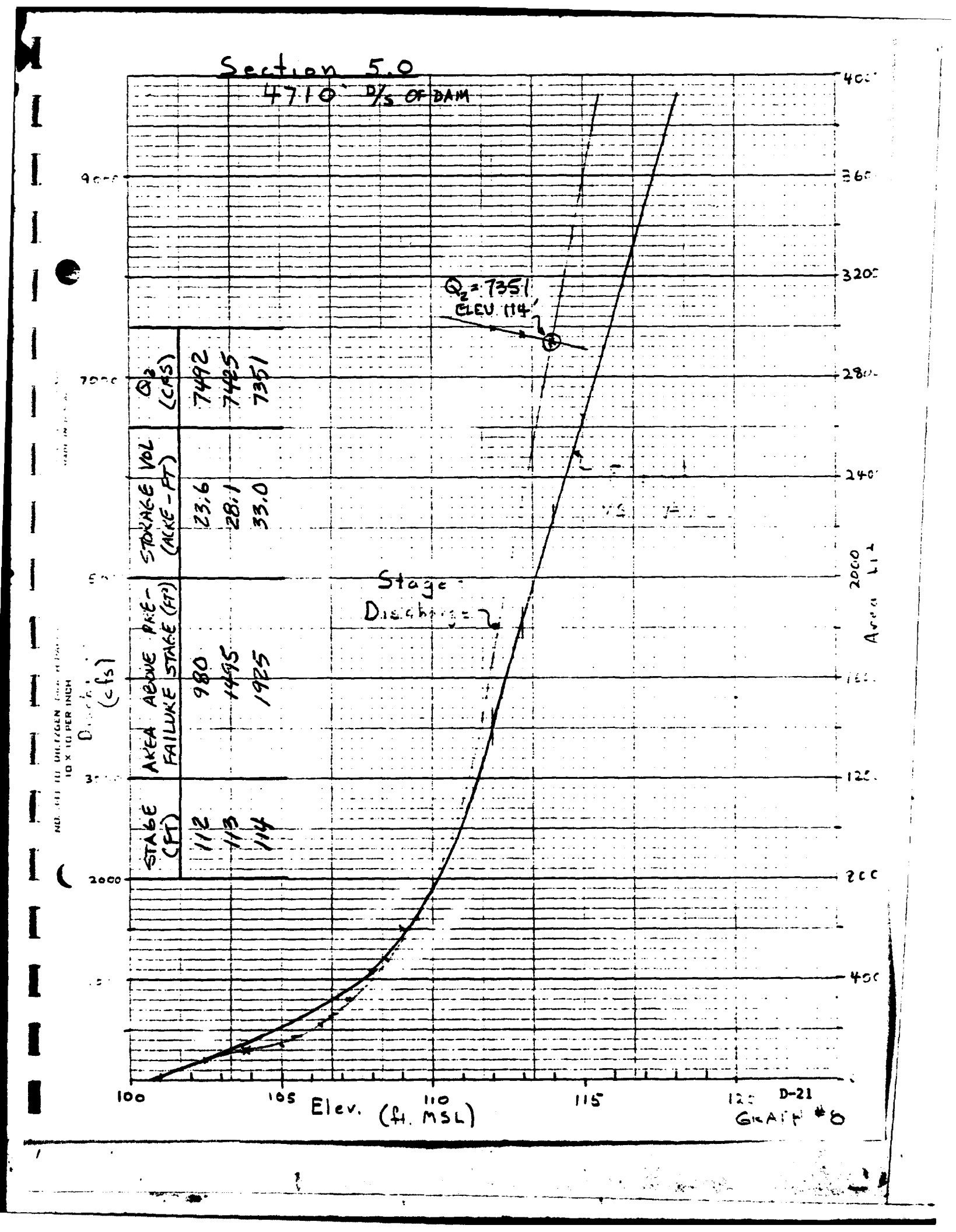

Section 3.0
2400' D/S OF DAM
Q (CFS)
8518
8342
8242
STORAGE VOL (ACRE-FT)
42.4
49.4
57.7
AREA ABOVE FAILURE STAGE (FT²)
1205
1730
2355
STAGE (FT)
155
156
157
Q₂ = 8455
ELEV. 155.5'
Stage vs Area
Stage vs Discharge
Discharge (CFS)
Elevation (ft. MSL)
9000
7000
3000
1000
0
146
148
150
152
154
156
158
D-19
GRAPH #6

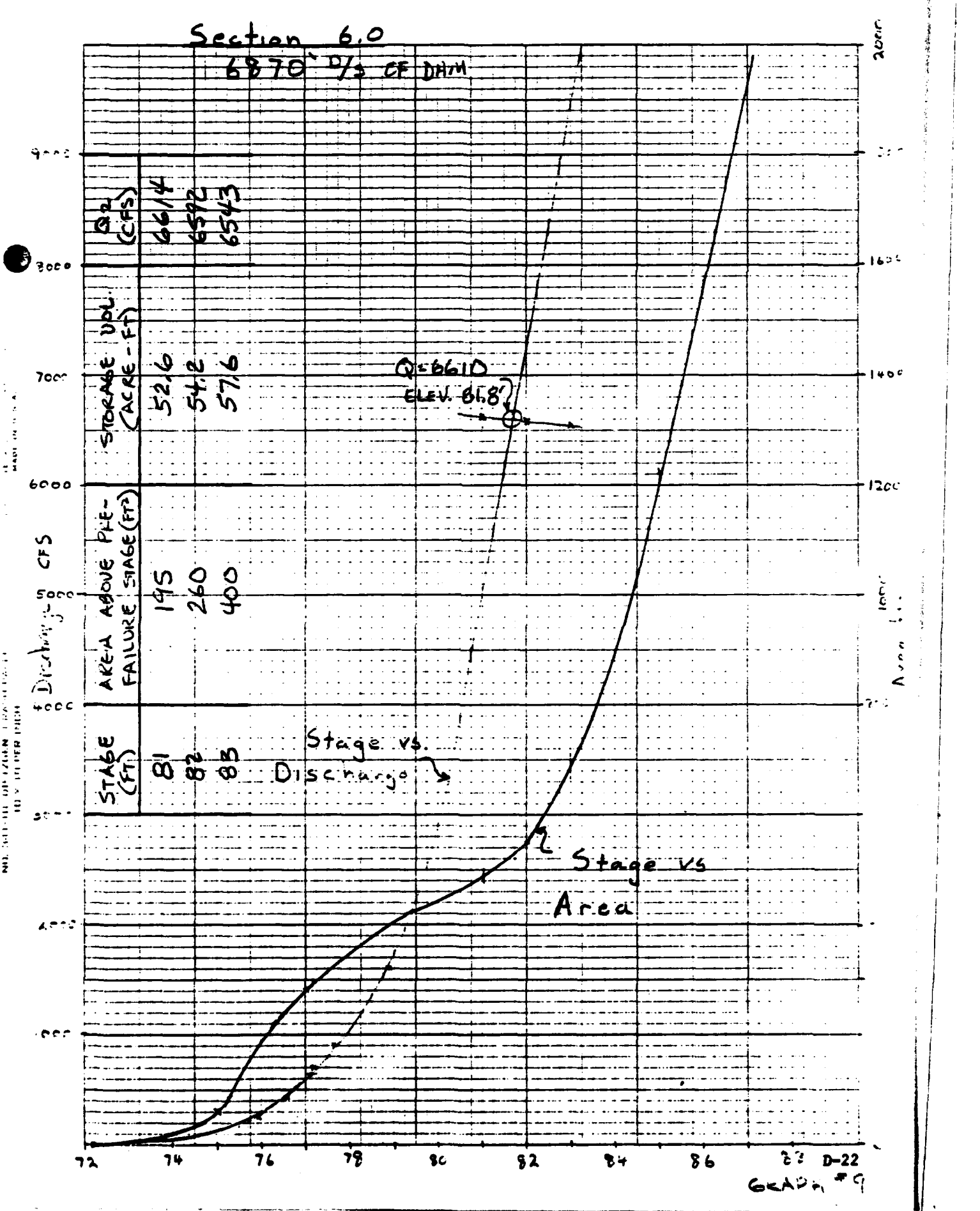
AD-A155 651 NATIONAL PROGRAM FOR INSPECTION ON NON-FEDERAL DAMS ARLINGTON RESERVOIR D..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV JUL 81 2/2

UNCLASSIFIED F/G 13/13 NL


1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

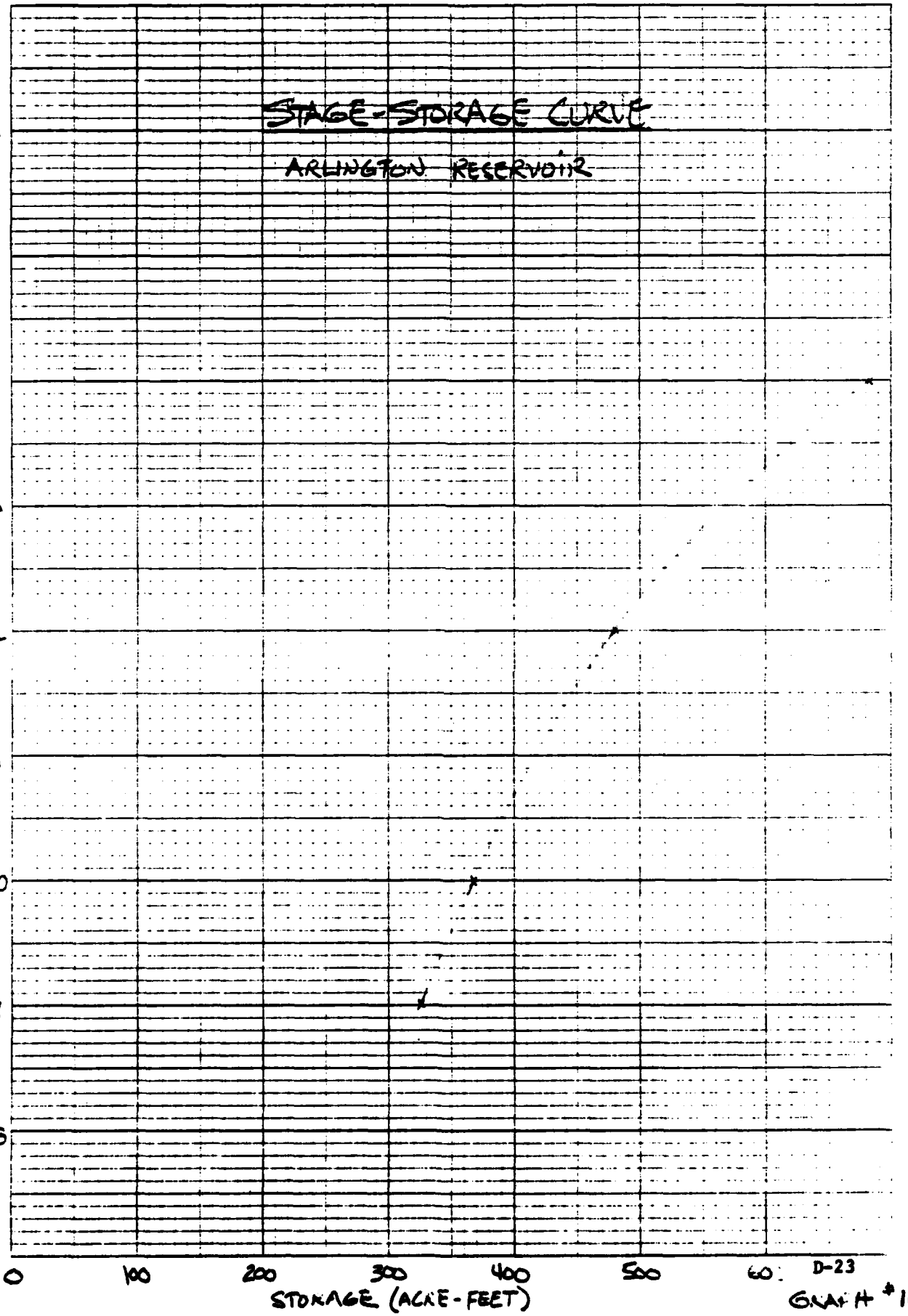

Section 4.0
3720' D/S OF DAM
Q_2 = 7848
ELEV. 125.9'
Stage vs Elevation
Elevation vs Area
STAGE (FT)
AREA ABOVE PRE-FAILURE STAGE (FT²)
STORAGE (ACRE-FT)
UDL
Q_2 (CFS)
125 780 34.2 7893
126 980 37.3 7863
127 1220 40.9 7784
Discharge (cfs)
Elevation
9000
7000
3000
1000
0
110
115
120
125
130
135
3200
1200
400
D-20
GRAPH #7


Section 5.0
4710' D/S OF DAM
Q_2 = 7351
ELEV 114'
Stage - Discharge
Q_2 (CFS)
7492
7425
7351
STORAGE VOL (ACRE-FT)
23.6
28.1
33.0
AREA ABOVE PRE-FAILURE STAGE (FT²)
980
1495
1925
STAGE (FT)
112
113
114
Elev. (ft. MSL)
100
105
110
115
D-21
GRAPH #6


Section 6.0
6870' D/S OF DAM
Q2 (CFS)
6614
6592
6543
STORAGE VOL. (ACRE-FT)
52.6
54.2
57.6
AREA ABOVE PIE-FAILURE STAGE (FT²)
195
260
400
STAGE (FT)
81
82
83
Q=6610
ELEV. 81.8'
Stage vs. Discharge
Stage vs Area
72
74
76
78
80
82
84
86
D-22

STAGE-STORAGE CURVE

ARLINGTON RESERVOIR



D-23

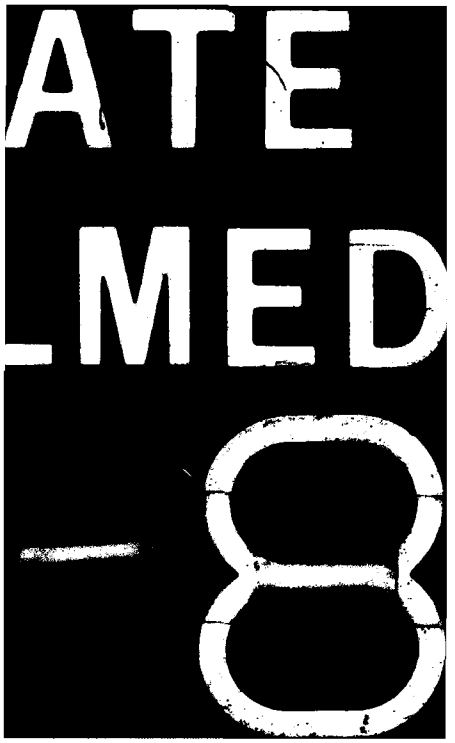
GRAPH #10

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME


ATE
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8